

The role of wildlife in the maintenance of FMD in Uganda



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A presentation made to the Global Foot-and-Mouth Disease Alliance Workshop, Hazyview, Kruger National Park, South Africa 17th April, 2012

Introduction

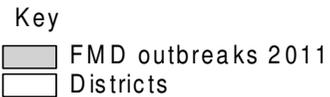
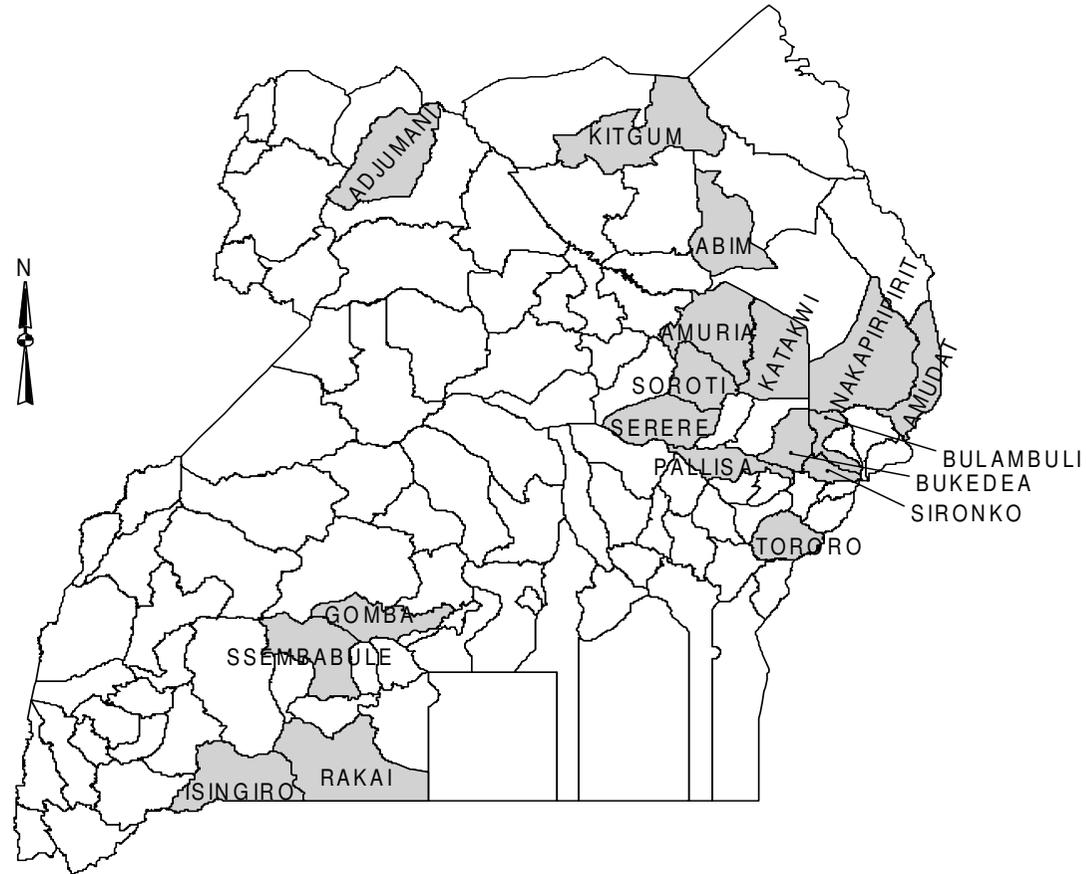
- FMD is endemic in Uganda, multiple serotypes and possibly strains of FMDV. Multiple risk factors including livestock-wildlife interactions.
- No much substantive epidemiological data. Vaccination and quarantine are the major methods employed to control the spread of FMD.
- African buffaloes (*Syncerus caffer*) believed to play a major role as reservoirs of the SAT-serotypes
- Epidemiological and diagnostic data on FMD is key for proper control measures
- Uganda is at stage 2 on the FAO/OIE tool for Progressive Control Pathway (PCP)

FMDV serotypes in Uganda

Time period	O	A	C	SAT 1	SAT 2	SAT 3
1950-1959	1955-59	1953, 1956-59		1953, 1959	1956, 1958-59	
1960-1969	1961-69	1960-69		1961	1966-69	
1970-1979	1970-76, 1978	1970-76	1970-71	1970-74, 1978	1970-76	1970
1990-1999	1998			1997, 1999	1991, 1995, 1998	1997
2000-2009	2000, 2006-2011	2002		2007	2002, 2007	

Serotype O is the common FMDV in Livestock e.g. 2006 to date. SAT 3 has never been isolated in livestock

FMD outbreaks in Uganda (2011)



Note: most outbreak are cyclical and reoccur at the beginning of almost each year, starting at the South Western Border

Research Objective 1.

Risk factors and patterns of FMD outbreaks in Uganda - retrospective study (2001-2008)

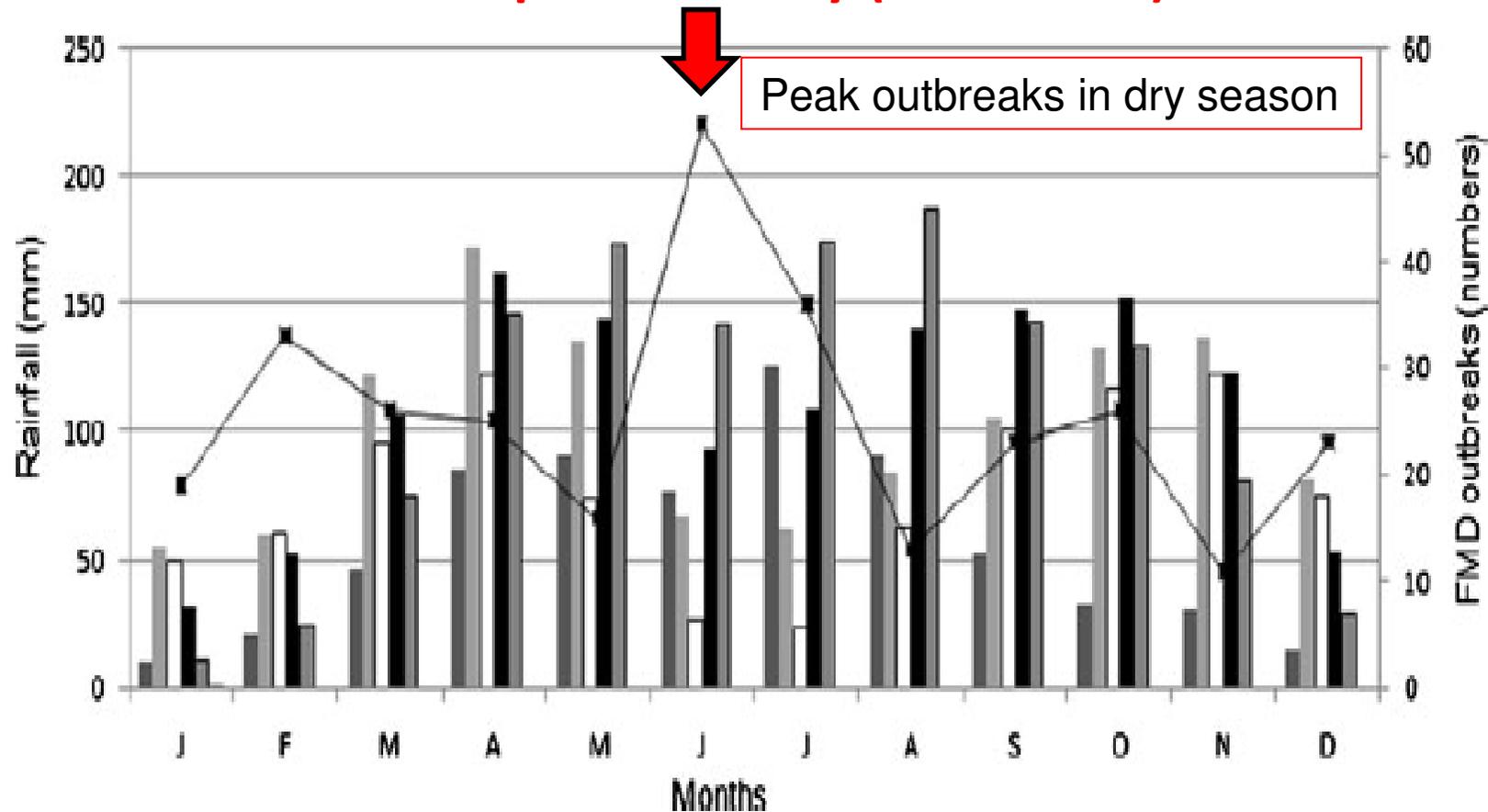


Fig. 2 Graph showing the variation in seasonal rainfall and the monthly distribution of FMD outbreaks in different regions of Uganda. Rainfall values (RF) were generalised for the Northeastern (NE), Northern (N),

Central (C), Southwestern (SW) and Western (W) regions. Key: ■ R (NE); ■ RF (N); □ RF (C); ■ RF (SW); ■ RF (W) → FMD (Outbreaks)

FMD outbreaks were reported over different years, months and regions

More outbreaks occurred during the dry season than the wet season (p-value 0.029) 6

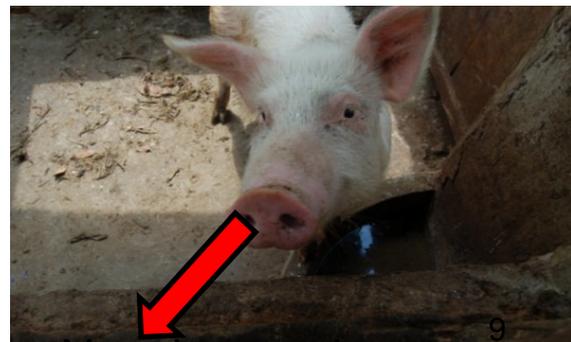
Occurrence of FMD outbreaks adjacent to national parks (2001-2008)

National Parks	Year of FMD occurrence in different sub-counties								Total
	2001	2002	2003	2004	2005	2006	2007	2008	
LMNP	2	5	6	3	3	2	-	2	23
MFNP	1	5	5	2	1	-	-	3	17
KVNP	-	-	-	-	-	-	-	-	0
QENP	-	-	-	-	-	1	-	-	1
KINP	-	-	-	1	1	-	-	-	2
SNP	-	-	-	-	-	-	-	-	0
RMNP	-	-	-	-	-	-	-	-	0
MGNP	4	-	-	-	-	4	-	-	8
BINP	-	-	-	-	-	-	-	-	0
MENP	-	9	3	2	1	1	-	-	16
BINP&QENP*	-	-	-	-	-	1	-	-	1
RMNP&QENP*	-	-	1	-	-	1	-	-	2
QENP, SNP &KINP*	-	2	1	-	-	9	2	-	14
Total	7	21	16	8	6	19	2	5	84

*outbreaks occurred in sub-counties sharing borders with more than one national park

- 84 out of 311 FMD outbreaks were reported in 53 sub-counties adjacent to the national parks. FMD outbreaks occurred more than once in 16 of these sub-counties.
- Average number of outbreaks per sub-county adjacent to a national park was 0.84 (84/100),
- Average number of outbreaks per sub-county not adjacent to a national park was 0.26 (227/858).
- The highest number of sub-counties affected by FMD were those adjacent to LMNP (23 outbreaks in 7 sub-counties), MFNP (17 in 10 sub-counties) and MENP (16 in 28 sub-counties), where outbreaks occurred during at least five out of the eight years included in this study (see table)

The concept of multiple risk factors for FMD transmission



Human transmission/contact & wind

Livestock-wildlife contacts

Animal movements

Animal meat

Nasal spread

Conclusions and recommendations (Obj.1)

- The average number of FMD outbreaks was higher for some sub-counties adjacent to national parks than for other sub-counties, while proximity to international border only seemed to play a role at the southern border
- This study supports that movement of infected animals is the most important factor for consideration in the transmission of FMD within endemic regions as reviewed by Rweyemamu et al. (2008)
- It is recommended that strategies for control of FMD in Uganda should at least include consideration of the season and animal movements

Research objective II.

The possible role of wildlife in the maintenance of FMDV in Uganda



Field sampling



•African buffalo samples: QENP (130), MFNP (54), LMNP (28) and KVNP (54) - 2001-2008, 23 sampling trips.



Study methods and analysis

- Analyzed wildlife samples collected at the Ministry of Agriculture Animal Industry and Fisheries, Uganda (2001-08)
- Ceditest NSP ELISA was used for screening purposes
- SPBE for the seven serotypes was used to identify FMDV serotypes. Samples were considered positive at dilutions \geq 80.
- Plus/minus qRT-PCR used to identify positive probang samples (3D and 5 UTR regions)
- Samples of high CT-values cultured on BTY cells to evaluate CPE
- Ag ELISA to assess possible serotypes
- RNA extraction, cDNA synthesis and creating overlapping PCR products and full length sequencing

NSP results –Non-buffalo samples (2005-2008)

National Park	Total samples collected	Total samples NSP tested	Total samples NSP positive
MFNP	5 Waterbucks	5	0
	7 Hartebeest	7	1
	1 Giraffe	1	0
LMNP	21 Impala	21	0
	1 Eland	1	0
	35	35	1

No significant evidence that non-buffalo species play a role in maintenance of FMDV

FMDV Antibody Results in buffalos (2001 – 2008)

National Park	Sampling Trip	Total Samples	Antibody screening results		Serotypes [†] identified at high dilutions (≥80)				
			NSP+	SP+	O	C	Sat 1	Sat 2	Sat 3
KVNP	SEPT. 02	12	10/12	5/12	0/2	0/4	4/6	0/6	1/6
	SEPT.05	21	10/21	3/10	*	*	*	*	*
	OCT.06	8	7/8	3/7	*	*	*	*	*
	NOV.06	10	9/10	3/10	0/1	**	1/1	*	**
	JUL.07	3	0/3	*	*	*	*	*	*
		54	36/54	14/39	0/3	0/4	5/7	0/6	1/6
LMNP	NOV.03	3	0/1	0/1	0/0	0/2	1/2	1/2	**
	JAN.06	6	6/6	0/6	0/1	**	**	3/3	**
	JAN.07	7	7/7	2/7	0/2	**	1/2	**	**
	APR.07	6	5/5	4/5	1/4	0/2	3/4	2/4	1/4
	OCT.08	6	*	*	0/4	0/6	4/4	0/5	1/5
		28	18/19	6/19	1/11	0/10	9/12	6/14	2/9
MFNP	SEPT.02	1	0/1	0/1	0/1	**	**	**	**
	OCT.05	20	20/20	7/20	2/3	0/3	3/3	3/3	3/3
	NOV.06	19	17/19	5/18	0/3	**	2/3	1/3	2/3
	OCT.07	14	14/14	7/14	1/4	0/2	3/4	2/4	4/4
		54	51/53	19/52	3/11	0/5	8/10	6/10	9/10
QENP	JUL.01	29	18/24	6/26	4/12	1/4	7/18	8/14	8/18
	JAN.06	3	0/3	**	**	**	**	**	**
	JAN.07	9	9/9	2/9	**	**	1/1	1/1	**
	APR.07	30	25/29	4/30	0/1	**	**	1/2	**
	JUL.07	12	11/12	0/12	1/2	**	1/1	1/1	**
	AUG.07	17	16/17	9/16	2/3	0/3	3/3	3/3	3/3
	SEPT.07	7	5/7	0/5	**	**	**	**	**
	JAN.08	16	15/16	6/16	**	**	**	**	**
	OCT.08	7	*	*	0/7	0/4	2/2	2/4	2/4
		130	99/117	27/114	7/25	1/11	14/25	16/25	13/25
Total		266	204/243	66/221	11/50	1/30	36/54	28/55	25/50

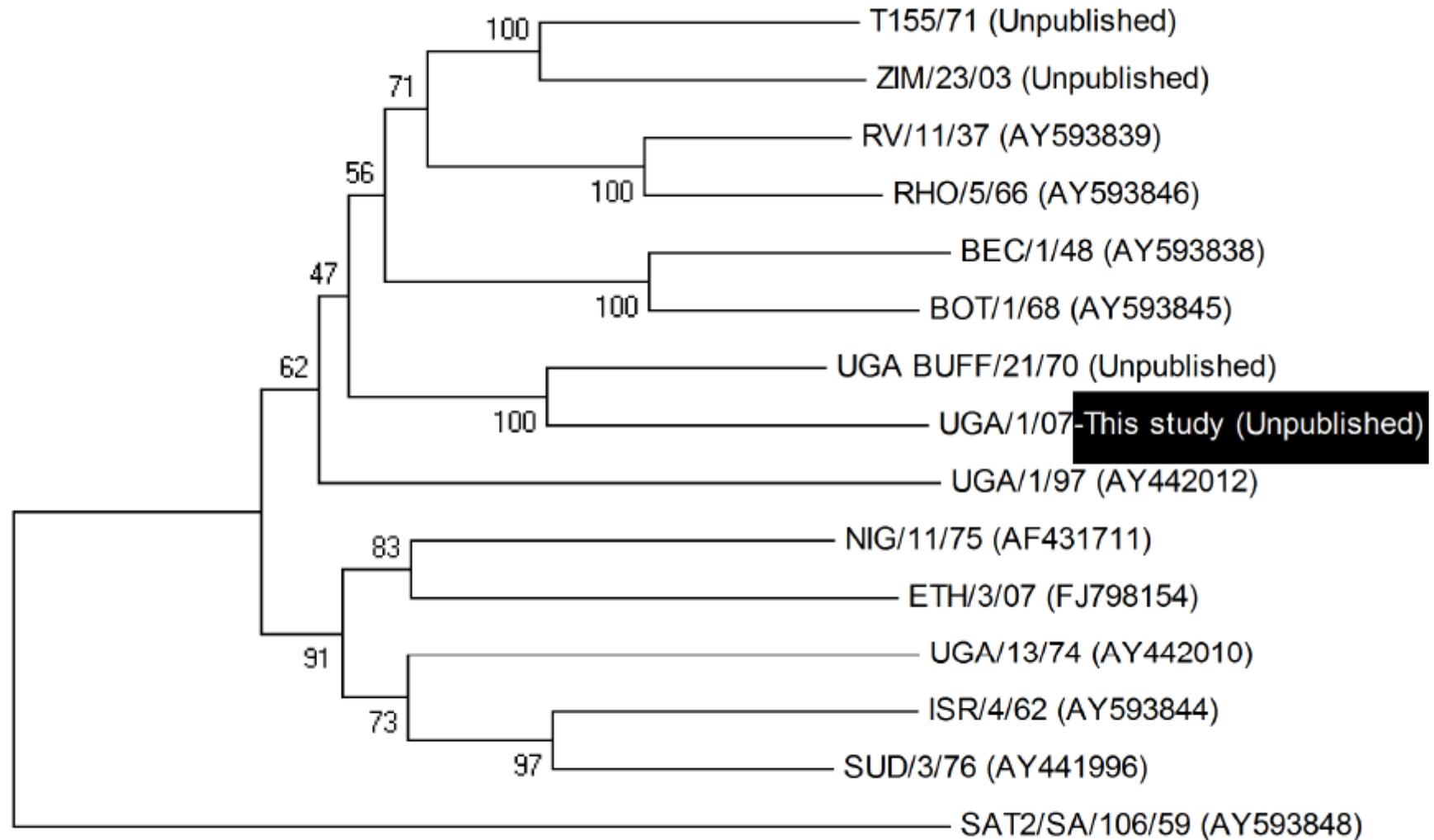
*: Not done

** : All tested negative

†: The numbers of samples titrated depended on the results of serotype screening in Solid Phase Blocking ELISA (results not shown) and the availability of sufficient sample amounts

- 84.0% seropositivity for the NSP antibodies
- 29.5% seropositivity for SP O antibodies
- FMDV seroprevalence: SAT 1 (36/54) > SAT 2 (28/55) > SAT 3 (25/50) > O (11/50) > C (1/30).
- Consistent detection of antibodies against FMDV among all the sampling trips ($n \geq 3$) in the different national parks for all the years 2001-2008.
- Mixed antibodies against different FMDV serotypes were detected during 12/23 (52%) sampling trips.

Neighbour-joining tree SAT 1 (This study) and



0.05

Figure 1

Neighbour-joining tree SAT 2 (This study) and the reference topotypes at WRLFMD

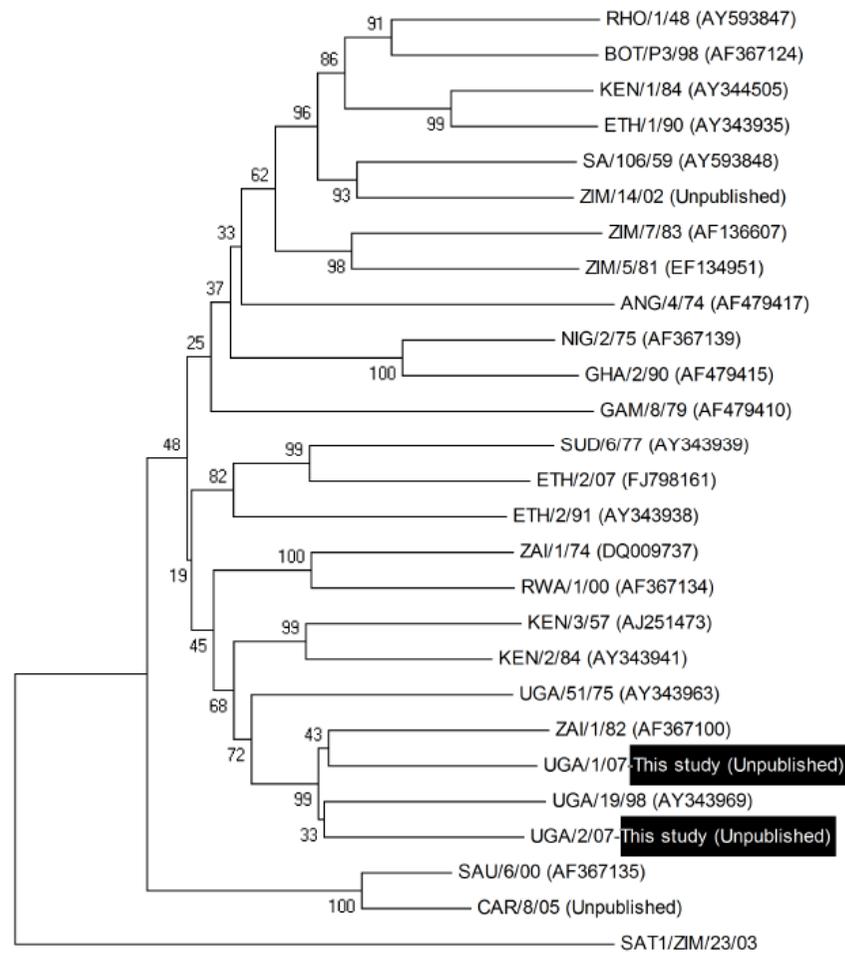


Figure 2 0.05

Conclusions

- African buffaloes are important reservoirs for at least the SAT serotypes of FMDV infections in the investigated national parks in Uganda. It is also very likely that FMDV serotype O is present in the buffalo population though at a lower level
- African buffaloes in Uganda seem to harbour a diversity of unique FMDV serotypes
- Further studies are needed –including virus characterization and molecular epidemiological studies



Acknowledgement



This is part of DANIDA funded collaborative research project on Livestock-Wildlife Diseases in East Africa by 4 Institutions:

1. National Animal Disease Diagnostics and Epidemiology Centre, Ministry of Agriculture Animal Industry and Fisheries, Entebbe, Uganda

2. Makerere University Institute of Environment and Natural Resources, Kampala, Uganda

3. National Veterinary Institute, Danish Technical University, Lindholm, Denmark

4. Department of Biology, University of Copenhagen, Denmark



Technical University of Denmark

DTU

Thanks to GFRA, ARC-OVI, USDA, EU-FMD, WRLFMD and all sponsors



THANK YOU

