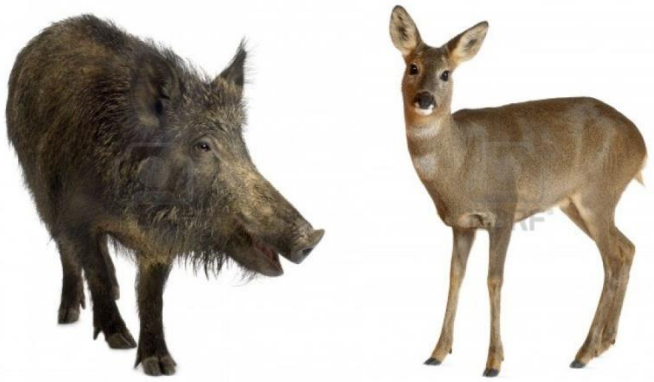
Developing strategy and building capacity to holistically address animal health issues at the wildlife-livestock-human interface in Eastern and Central Europe

Wildlife health and management

Keith Sumption (EuFMD), Sergei Khomenko (FAO), Naci Bulut (SAP, Ankara) & Tsviatko Alexandrov (BFSA)

Issues addressed:

- Wildlife population - concerns and threats
- Historical evolution of disease in wild life in Europe
- Surveillance and control strategies
- ecology and disease: space use and social interactions

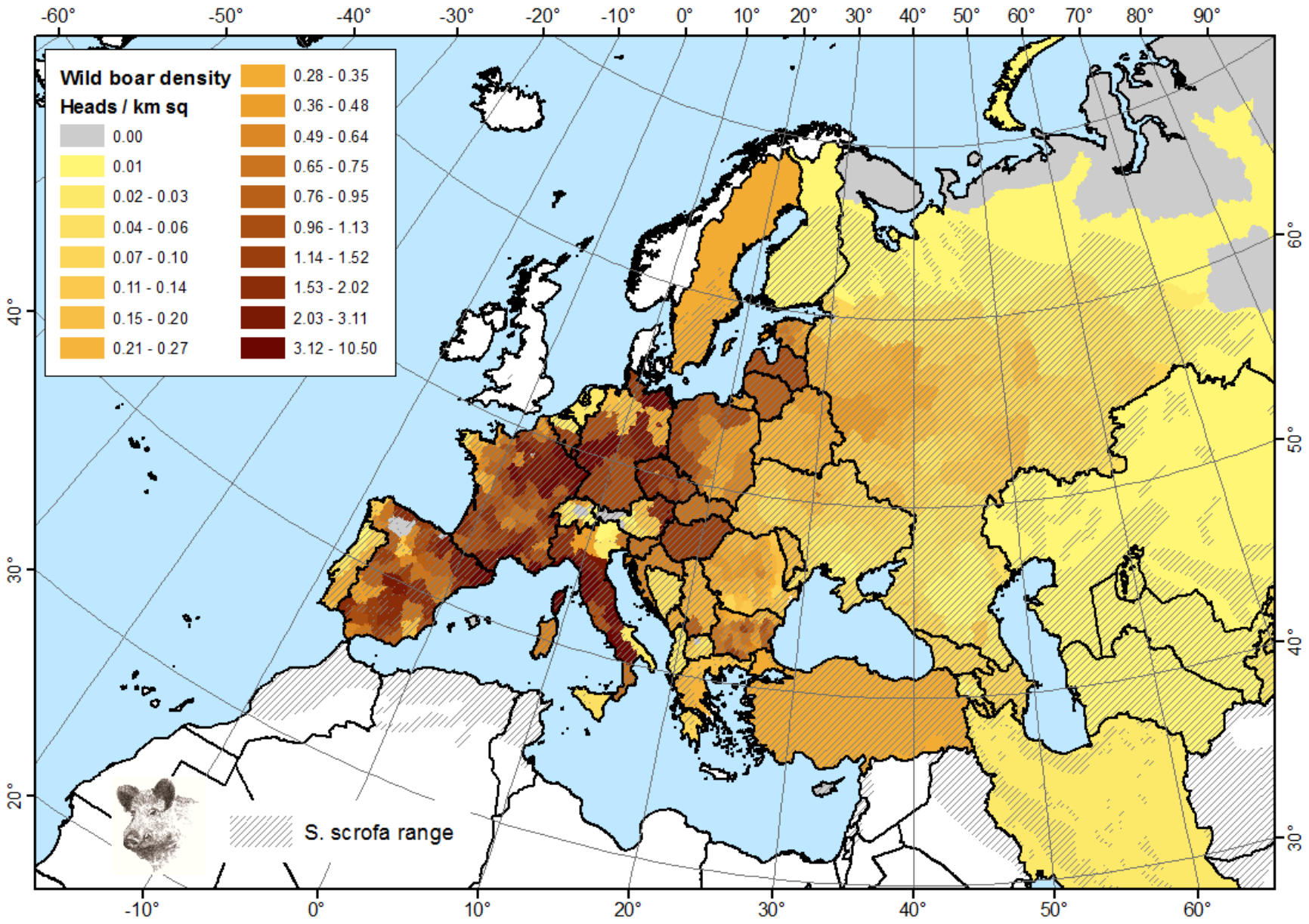


Population sizes in Europe

Spring (post harvest) census data

- Wild Boar – **4,500,000** (Putman, 2011; EMPRES data);
- Roe Deer – **9,500,000** (Burbaitė & Csanyi, 2009);
- Red Deer – **1,700,000** (Burbaitė & Csanyi, 2010).

20 – 22 million FMD susceptible ungulates after reproduction


Wild boar density
Heads / km sq
0.00
0.01
0.02 - 0.03
0.04 - 0.06
0.07 - 0.10
0.11 - 0.14
0.15 - 0.20
0.21 - 0.27
0.28 - 0.35
0.36 - 0.48
0.49 - 0.64
0.65 - 0.75
0.76 - 0.95
0.96 - 1.13
1.14 - 1.52
1.53 - 2.02
2.03 - 3.11
3.12 - 10.50
S. scrofa range
-60° -50° -40° -30° -20° -10° 0° 10° 20° 30° 40° 50° 60° 70° 80° 90°
60° 50° 40° 30° 20°
-10° 0° 10° 20° 30° 40° 50° 60°

Background

- Remarkable increase of wild ungulate population in Europe
- significantly increased epidemiological role (particularly of wild boar), as actual (e.g. ASF, CSF, *trichinellosis,*) or potential (e.g. FMD) host species for a range of important livestock and human pathogens
- threat for re-emergence, spread and maintenance of some endemic and exotic diseases

Recent examples

- CSF outbreaks in Latvia (2012, 2014)
- FMD incursion to Bulgaria (2011),
- ASF epidemic in the Caucasus and Russian Federation (2007-2013),
- ASF epidemic in wild boar in Lithuania, Latvia, Estonia, Poland (2014 $\longrightarrow$)

Radical solutions to these problems?

- Local extermination of wild boar as a species (Russia, Belarus), or
- building fences to create ecological barriers to discontinue wildlife populations, thus preventing spread of disease (Bulgaria, Lithuania, Latvia, Poland), seriously considered by the governments
- “repellents” for wild boar (Latvia)

unacceptable from ecological and economical standpoint these “simple” solutions do not solve the problem, but **rather create new ones**.

Foot-and-Mouth Disease (FMD) and wildlife

- ✓ Short lived period of infectivity (hit and run agent) : to circulate needs supply of naive contact groups – OR persistence in environment (e.g carcasses)
- ✓ Domestic and wild pigs easily infected by oral route and shed very large quantities of virus
- ✓ WIDE Range of wildlife species can be infected (ruminants mainly by aerosols)
- ✓ European wildlife species susceptible: wild boar, all deer species, chamois, ibex,…(hedgehogs)
- ✓ Natural reservoir in African buffalo (long term carriers), probably original host before adaptation in evolution to cattle/other species
- ✓ Wildlife might acquire from domestic animals /carcasses of dead wildlife (gazelle-wild boar cycle Israel)
- ✓ Even a single small outbreak in Europe is extremely damaging (100 m €+, to countries if involved in extensive trade).

Foot-and-Mouth Disease and wildlife

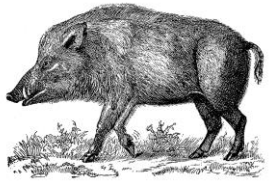
Until 2011

- No evidence of wildlife involvement in the recent major epidemics in Europe 1920s-2007
- It was assumed wildlife will have limited role in domestic FMD outbreaks (spillovers of limited consequence)

SHOCK !!!! FMD in Bulgaria- 2011

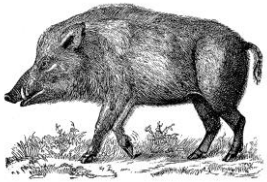
- ✓ Detected first in hunted wild boar
- ✓ lab staff familiar with FMD
- ✓ Lesions along coronary band
- ✓ FMDV detected and reported

Problems – the FMD epidemic in Bulgaria



- Entry of infection to free region - unable to prove if started in wild animals or domestic
- Many missing links between the outbreaks in domestic animals. Wildlife involved?
- Duration of epidemic in domestic stock: 4 months
- Total period to regain freedom : 17 months (UK 2001, 11 months)
- Extremely difficult to prove freedom when wildlife have been shown to be involved
- Issues between neighbouring countries re: wildlife – fear of being infection being driven across borders

EFSA, 2012; Alexandrov et al., 2013, Dhollander et al. 2014



Epidemiologically:

- Spread was spatially and temporary limited, did not extend to all the population in Strandzha forest;
- Transmission between livestock and wildlife was both ways (facilitated by humans?);
- NOT highest density wildlife and domestic interactions in Europe – longer persistence elsewhere???

On surveillance

- Hunting or trapping wild boar has severe limitations
- Antibodies in wildlife do not indicate WHEN infection occurred
- Far more intensive sampling of wildlife (for active infection) needed than possible
- Alternatives to killing wildlife for sampling needed

EFSA, 2012; Alexandrov et al., 2013, Dhollander et al. 2014

Instructions available

- EU legislation ???
- EFSA Scientific Opinions /Statements /Guidances of the Panel on AHAW on CSF, ASF, FMD in Thrace
- Guidelines on surveillance/monitoring, control and eradication of classical swine fever in wild boar European Commission, 2010 Document SANCO/7032/2010 (EC Homepageaddress: http://ec.europa.eu/food/animal/diseases/controlmeasures/csf_en.htm)

Needs and perspectives

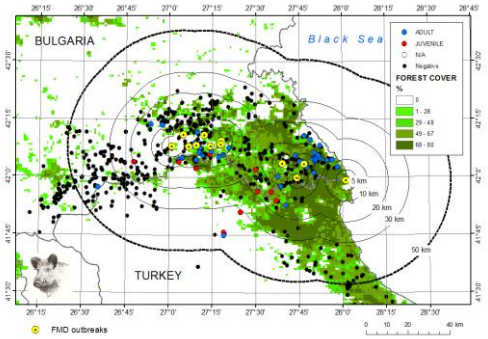
- a comprehensive, holistic approach to address the “wild boar/wildlife problem”.
- Scientifically sound population management and wildlife health status control strategies, based on the best available knowledge, standardized and officially accepted on the pan-European scale (both in EU and non-EU countries);
- practical solutions to the disease surveillance, prevention and control efforts, including use of innovative techniques, methods and management options that are to be disseminated and incorporated into the routine work of wildlife/hunting communities

Experience so far….

- Plan for FMD control in wildlife/ BG
- Surveillance for FMD in wild boar in Thrace and Anatolia /BG,TUR
- Laboratory trials for FMD surveillance in wild boar/FLI
- Wild boar telemetry study /BG
- Trials on NI sampling /BG, SER, FLI, Nepal
- Game collection centers in case of epidemics in wildlife/GER, BG
- Trapping as alternative method to eradicate disease /BG
- Data on wildlife attendance at feeding sites and salt licks/BG

Research topics:

- Surveillance for FMD in wild boar: 2011 epidemic in Thrace v endemic conditions in Anatolia
- To kill or not to kill: non-invasive collection of saliva from wild ungulates for diagnostic purposes
- Wild boar ecology and disease: space use and social interactions in a wild boar population on a year-round basis



The way ahead: an integrated approach?

Contingency planning to protect wildlife populations and minimise impact if overspill occurs

Operationalise plans to

1. **Prevent** - reduce spillovers from domestic animal infections
   - Risks practises identified, targeted measures/communication
2. **Manage** epidemics in wildlife more actively :
   - Part of FMD contingency planning (not only domestic!)
   - ANIMO approach – including NI sampling of wildlife and ANI (accelerated natural immunity)
3. **Recover** : Use NI (non-invasive) sampling to prove freedom

ANIMO (Active, Non-Invasive Management of Outbreaks) approaches need optimisation and testing in the field – options in Turkey , Caucasus and parts of mid-east for FMD

Acknowledgements:

- the support that was provided rapidly from DG-SANTE through the EuFMD Research Fund to enable field studies.
- The Governments of Turkey and Bulgaria and FLI for positive, continuous support to field work.

Foot & Mouth Disease

epidemics in Bulgaria in 2011 and the silence of wild boar

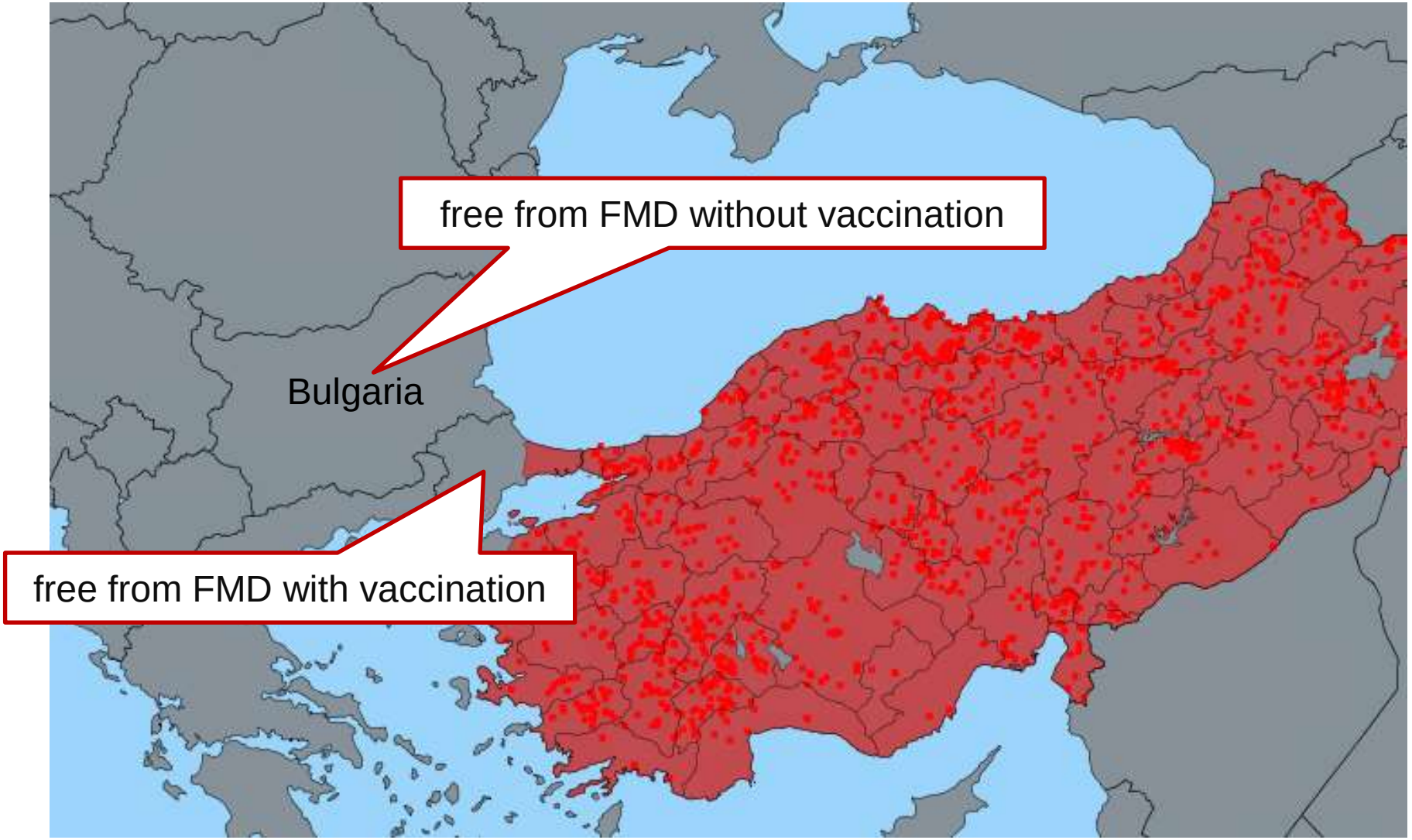
Practical Training of Wildlife Surveillance, *Vitoshko-Studena, Bulgaria*, *22-25 Feb 2016*

Tsviatko Alexandrov

History of FMD in Bulgaria in the 90-ies

1. Stefan Karadjovo 1991; 2. Simeonovgrad 1993; 3. Malko Sharkovo 1996;

FMD outbreaks in 2010

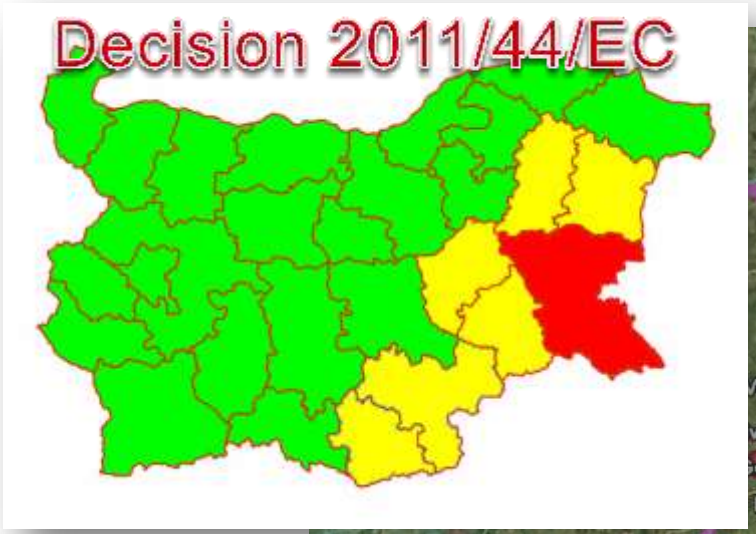


Source: ADNS

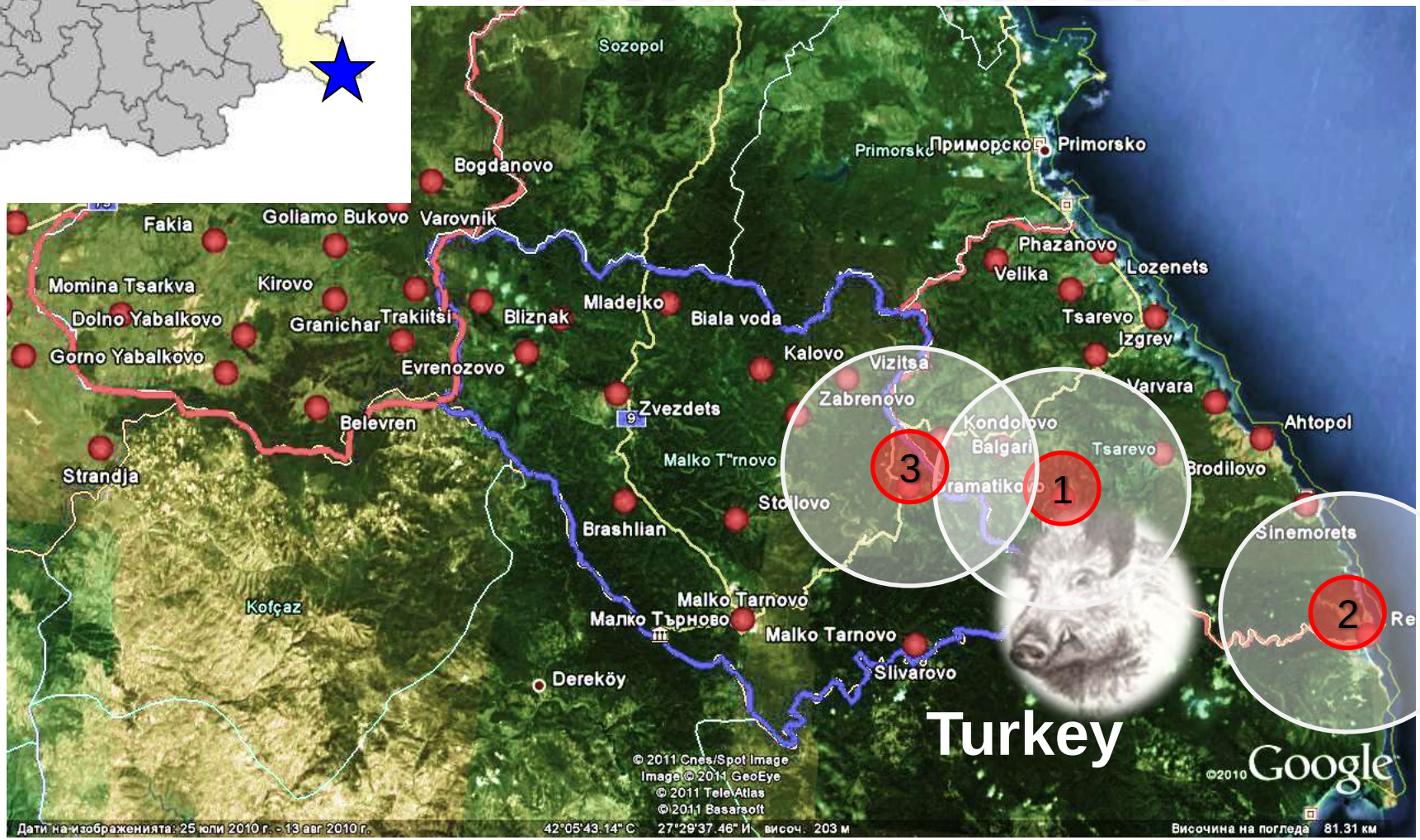
4th Jan 2011, 22:00 p.m.

Wild boar positive for FMD type O;

5th Jan - Start of the measures for control and eradication of FMD according to Dir. 2003/85/EC. Clinical and epidemiological examinations as well as blood sampling of susceptible animals in all villages located in the risk area



First wave – Jan 2011



1. Kosti, (9th Jan) in the vicinity of the place were the wild boar was shot;
2. Rezovo, (15th January) located at the border with Turkey;
3. Gramatikovo, (31st Jan) situated about 7 km west of Kosti,

Kosti – the village of the bones


15.01.2011


15.01.2011


15.01.2011


15.01.2011


15.01.2011


15.01.2011


15.01.2011


15 01 2011


ЗАБРАНЕНО
ФОТОГРАФИРАНЕТО
НА СЪСЕДНА ТЕРИТОРИЯ
NO PHOTOGRAPHY PERMITTED
IN NEIGHBOUR TERRITORY
No admittance!
Infectious animal
disease!
Влизането
забранено!
Заразна болест
по животните!

15 01 2011


ПОЛИЦИЯ
15.01.2011


15.01.2011


VirKon S
VirKon S
VirKon S

Rezovo

No Man’s land beyond the barn wire

Rezovo Резово
© 2010 Tele Atlas
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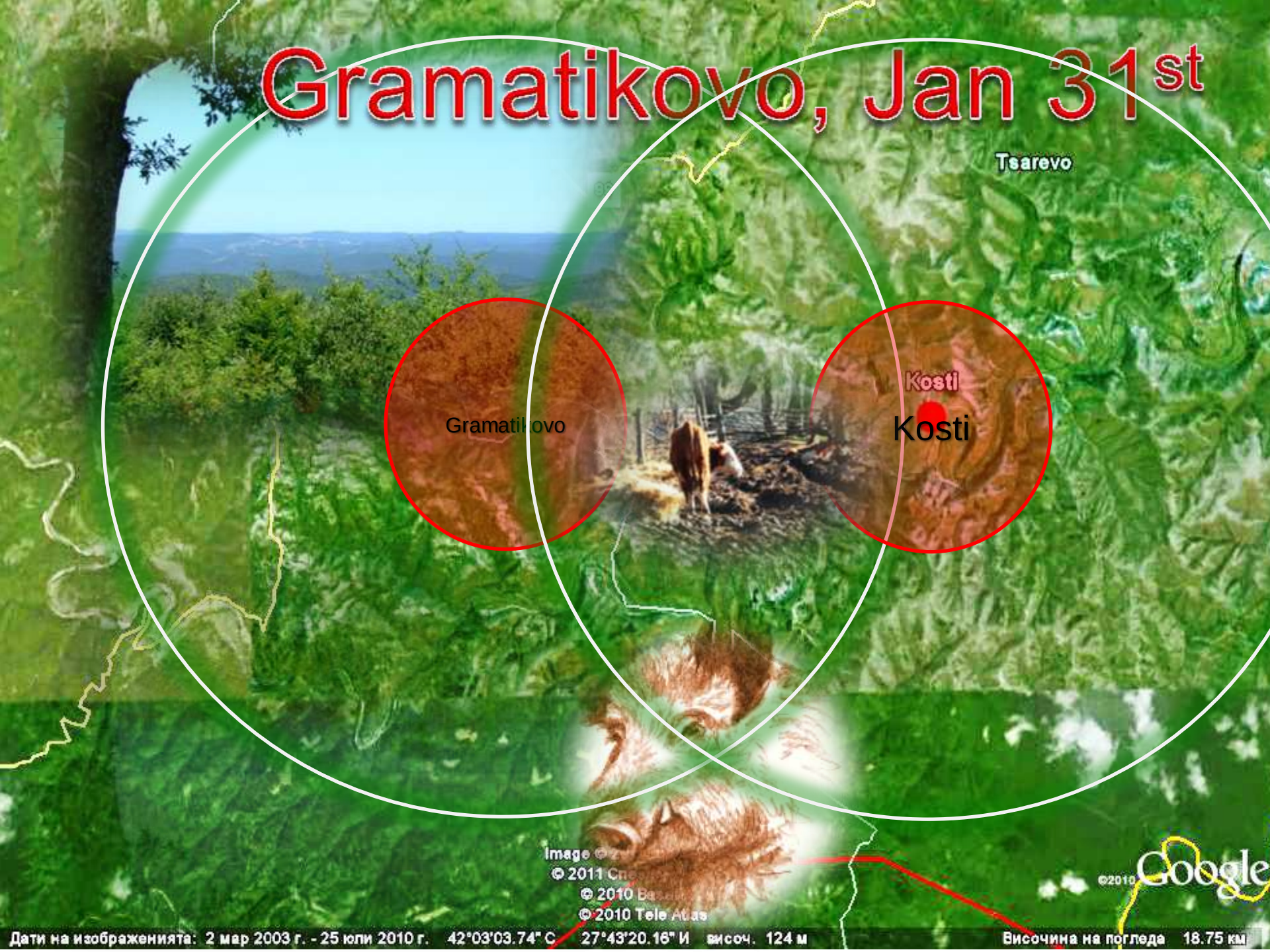
© 2011 Cnes/Spot Image
© 2010 Basarsoft
41°59'11.96" N 28°01'34.95" E elev 33 m
©2010 Google
Eye alt 1.78 km

Disinfection at the only exit from Rezovo


WB
93R


Gramatikovo, Jan 31st
Tsarevo
Gramatikovo
Kosti
Kosti
Image
© 2011
© 2010
© 2010 Tele Atlas
©2010 Google
Дати на изображенията: 2 мар 2003 г. - 25 юли 2010 г. 42°03'03.74" С 27°43'20.16" И височ. 124 м
Височина на погледа 18.75 км

FMD or not FMD?


46 days later
Infected farm
42 km
1
2
3
Burgas
Straidzha
Veselie
Primorsko
Novo Panicharevo
Sozopol
Krushavets
Yasna Poliana
Kiten
Varshilo
Lozenets
Panchevo
Valchanovo
Indje Voivoda
Pismenovo
Kamene
Sredets
Varovnik
Bogdanovo
Phazanovo
Velika
Tsarevo
Slivovo
Yambol
Biala Voda
Ahtopol
Goliamo Bukovo
Trakiitsi
Mladejko
Varvara
Evronozovo
Kalovo
Vizitsa
Kondolovo
Brodilovo
Sinemoretz
Kirovo
Zvezdets
Granichar
Momina Tsarkva
Malko Tarnovo
Gramatikovo
Rezovo
Boljarovo
Gorno Yabalkovo
Belevren
Stoilovo
Brashlian
Strandja
Malko Tarno
Krainovo
Koçaz
Lesovo
Demirköy
Lalapaşa
Matochina
Pınarhisar
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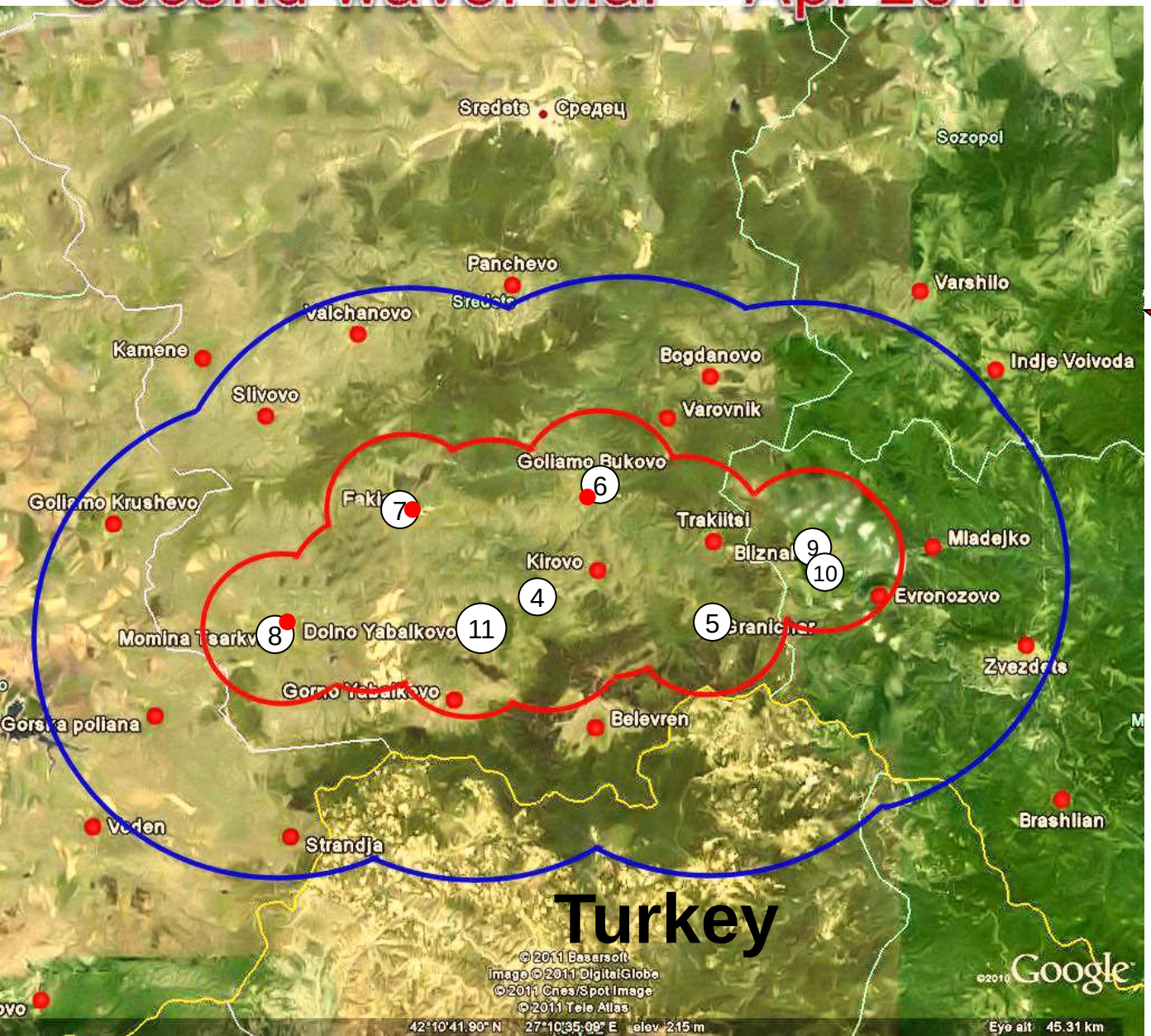
© 2011 Basarsoft
©2010 Google
42°08'36.57" С 27°19'59.69" И височ. 418 м
Височина на погледа 119.41 км

EUFMD
EUROPEAN COMMISSION FOR THE CONTROL OF FOOT-AND-MOUTH DISEASE

eufmd e-Learning

Second wave: Mar – Apr 2011



Infected area (second wave)

not infected village

Outbreaks:

4 . cattle farm near Kirovo (19th March)
5. Granichar (24th March)
6. G. Bukovo (25th March)
7. Fakia (25th March)
8. Momina Tsarkva (25th March)
9. Bliznak (3rd April)
10. Farm near Bliznak (3rd April)
11. Dolno Yabalkovo (7th April)

Protection zone

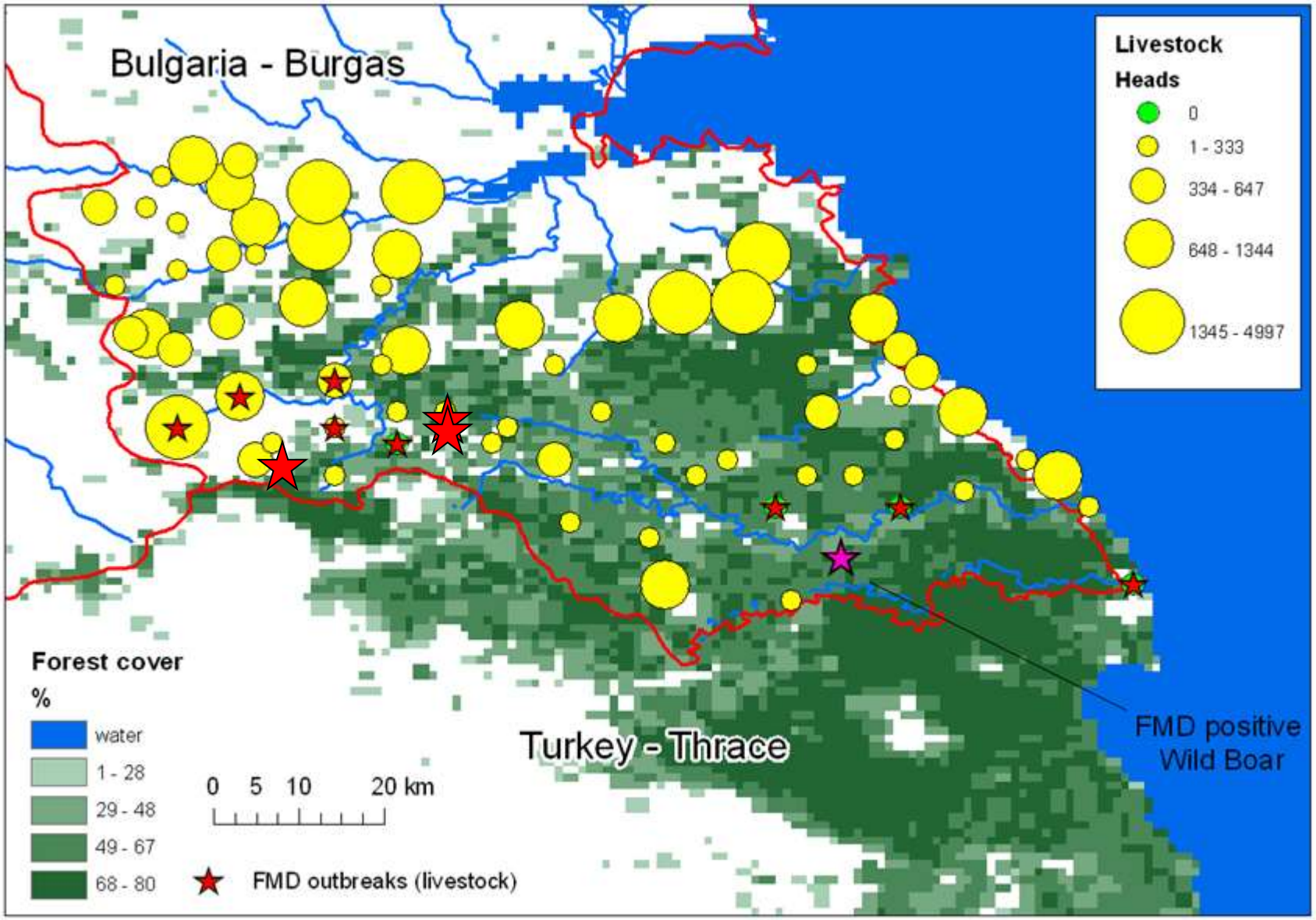
Surveillance zone

Positive wild boar (4th Jan 2011)

FMD outbreak (first wave Jan 2011)

FMD outbreak (second wave March - April 2011)

11 FMD outbreaks in Bulgaria in 2011



Map produced by Sergei Khomenko

Total livestock per village

TCS analysis of complete genome sequences:

Putative common ancestor

- Bulgarian (wild boar included) outbreaks
- First phase of Bulgarian outbreaks in livestock
- Second phase of Bulgarian outbreaks in livestock

Data Generated by IAH-Pirbright and DTU-Lindholm

Control in the protection and surveillance zones

Last outbreak - 7th April

Clinical examinations on daily basis negative for FMD clinical signs

Blood sampling on 18-19 April

Blood sampling on 28 - 29 April

Blood sampling on 18-19 May

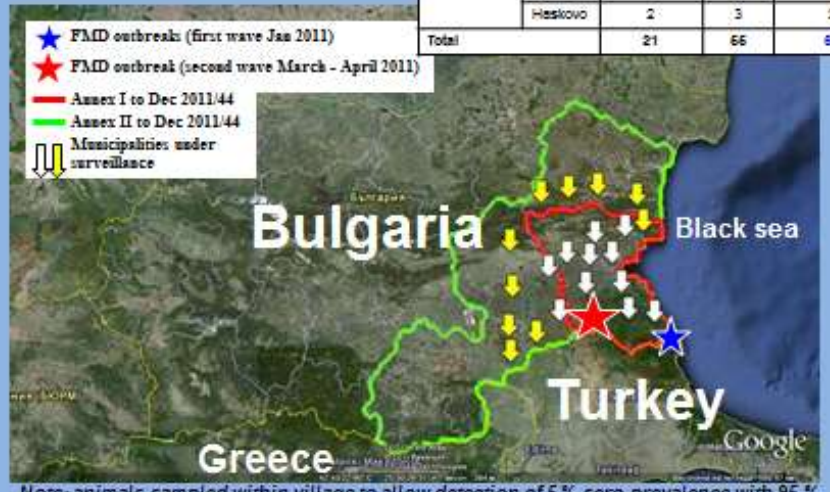
Note: animals sampled within village to allow detection of 5 % sero-prevalence with 95 % confidence

Control outside the protection and surveillance zones

Serological surveillance (18-19 April) outside surveillance and protection zones

6942 blood samples of susceptible animals tested FMD *negative* (type O ELISA);

Dec 2011/44	Region	Municipalities sampled	villages sampled	Domestic susceptible animals sampled
Annex I	Burgas	10	33	4509
Annex II	Varna	2	2	307
	Shumen	2	4	524
	Sliven	1	4	494
	Yambol	4	9	811
	Haskovo	2	3	297
Total		21	66	6942



Note: animals sampled within village to allow detection of 5 % sero-prevalence with 95 % confidence.

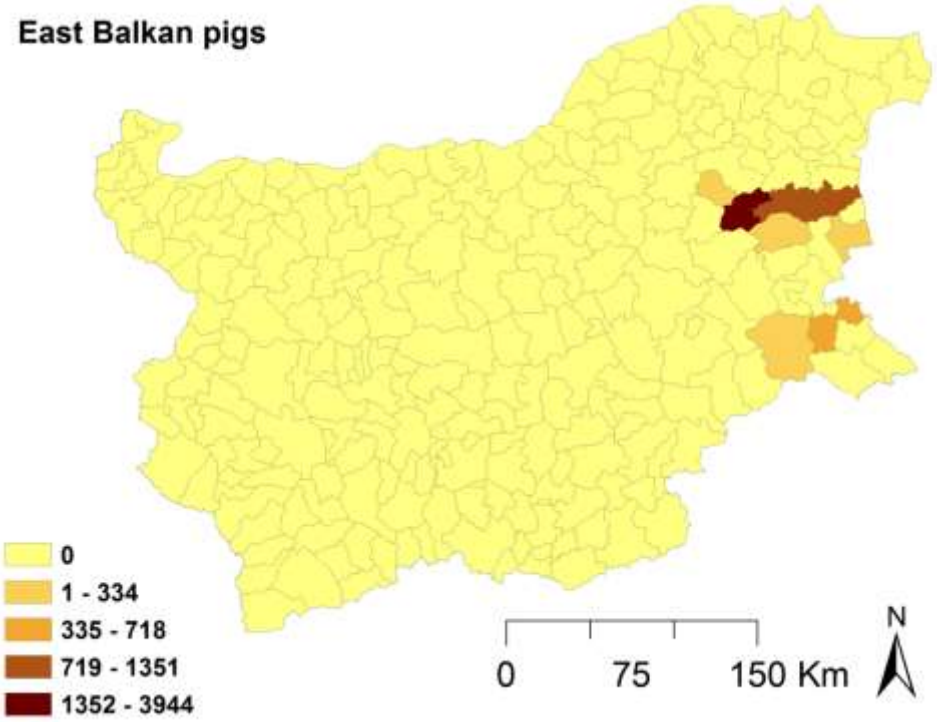
Serological surveillance (18-19 May) outside surveillance and protection zones

1172 blood samples of susceptible animals tested with *negative* results for FMD;

Dec 2011/44	Region	Municipalities sampled	villages sampled	Domestic susceptible animals sampled
Annex I	Burgas	3	3	297
Annex II	Varna	2	2	178
	Shumen	2	2	108
	Sliven	1	1	100
	Yambol	2	3	262
	Haskovo	2	3	227
Total		12	14	1172

Note: animals sampled within village (all villages are different from those sampled on 18-19 April) to allow detection of 5 % sero-prevalence with 95 % confidence.

Surveillance in East-Balkan pigs, 2011 - 2012



Region	Number of blood samples tested
Burgas	553
Shumen	582
Varna	80
Total	1215

Plan for the control of FMD in susceptible wildlife in South-East Bulgaria

- clinical examinations and monitoring of all herds every 21 days;
- blood sampling for serological surveillance to detect 5 % sero-prevalence with 95 % confidence within epidemiological unit every third month
- FMD susceptible animals can leave "Cordon sanitaire" only for slaughter under special authorisation by veterinary service
- Products thereof can leave "Cordon sanitaire" only after special treatment and under special authorisation by veterinary service
- Surveillance in wildlife

Number of villages	Animal holdings at Village	Number of animals per Village					Wild Life at the area of village		Hunting fields
		Cattle	Sheep	Goats	Buffalo	Pigs	Number of wild boar	Number of wild ruminants	
106	3 696	10 837	45 258	17 216	176	3 346	4 507	5 424	141

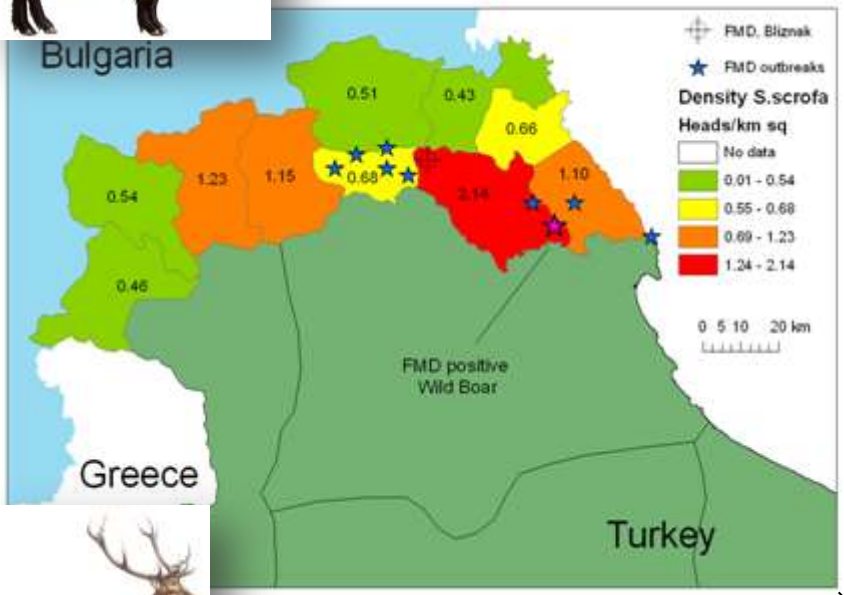
Sero-surveillance in susceptible livestock in the "Cordon Sanitaire", Aug 2011 – Feb 2012

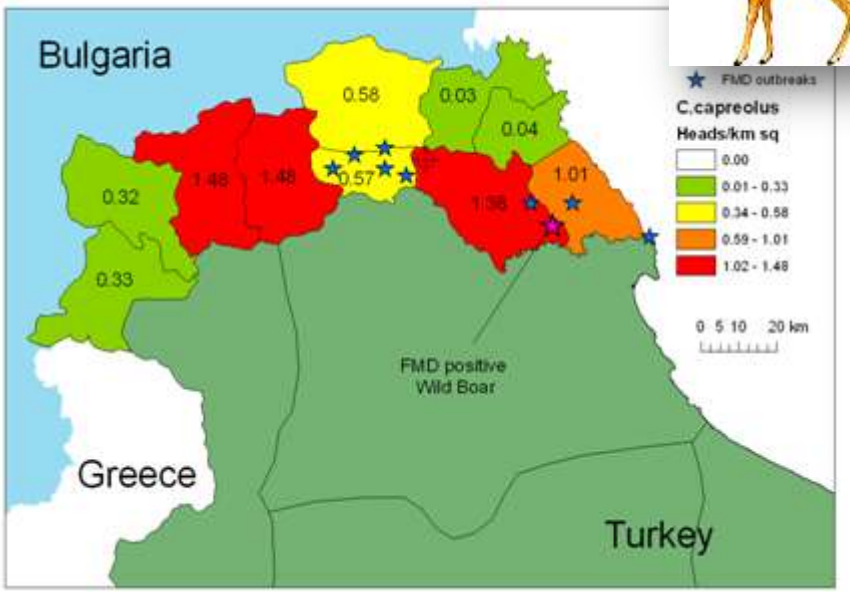
Sampling period	Villages, n	animal holdings, n	Animals, n					blood samples taken to detect 5 % prevalence with 95% confidence within village, n	Lab results Type O ELISA
			cattle	sheep	goats	buffalos	pigs		
16-25Aug 2011	106	3696	10 834	44 156	17 032	176	3 275	5203	negative
21-25 Nov 2011	106	3 701	10 834	44 172	17 059	176	3 277	5 295	negative
20 -25Feb 2012	106	3287	11384	43358	16612	153	2766	5334	negative

Strandzha mountain
and the silence of wild boar

S. SCROFA

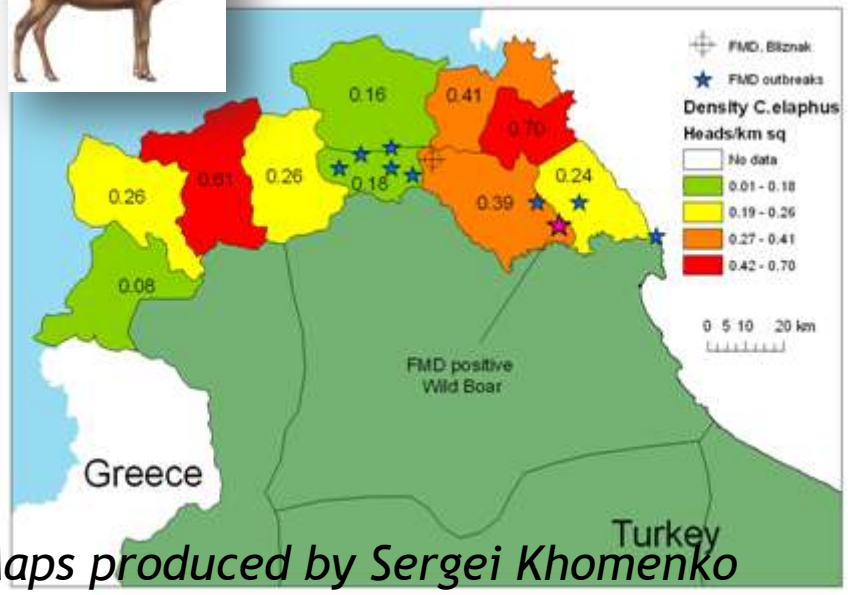
C. CAPREOLUS

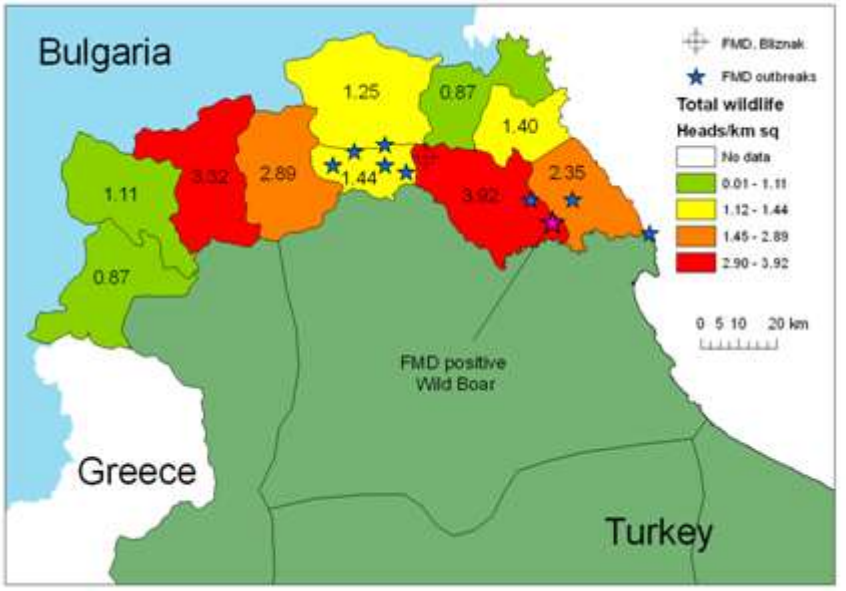




C. ELAPHUS

TOTAL

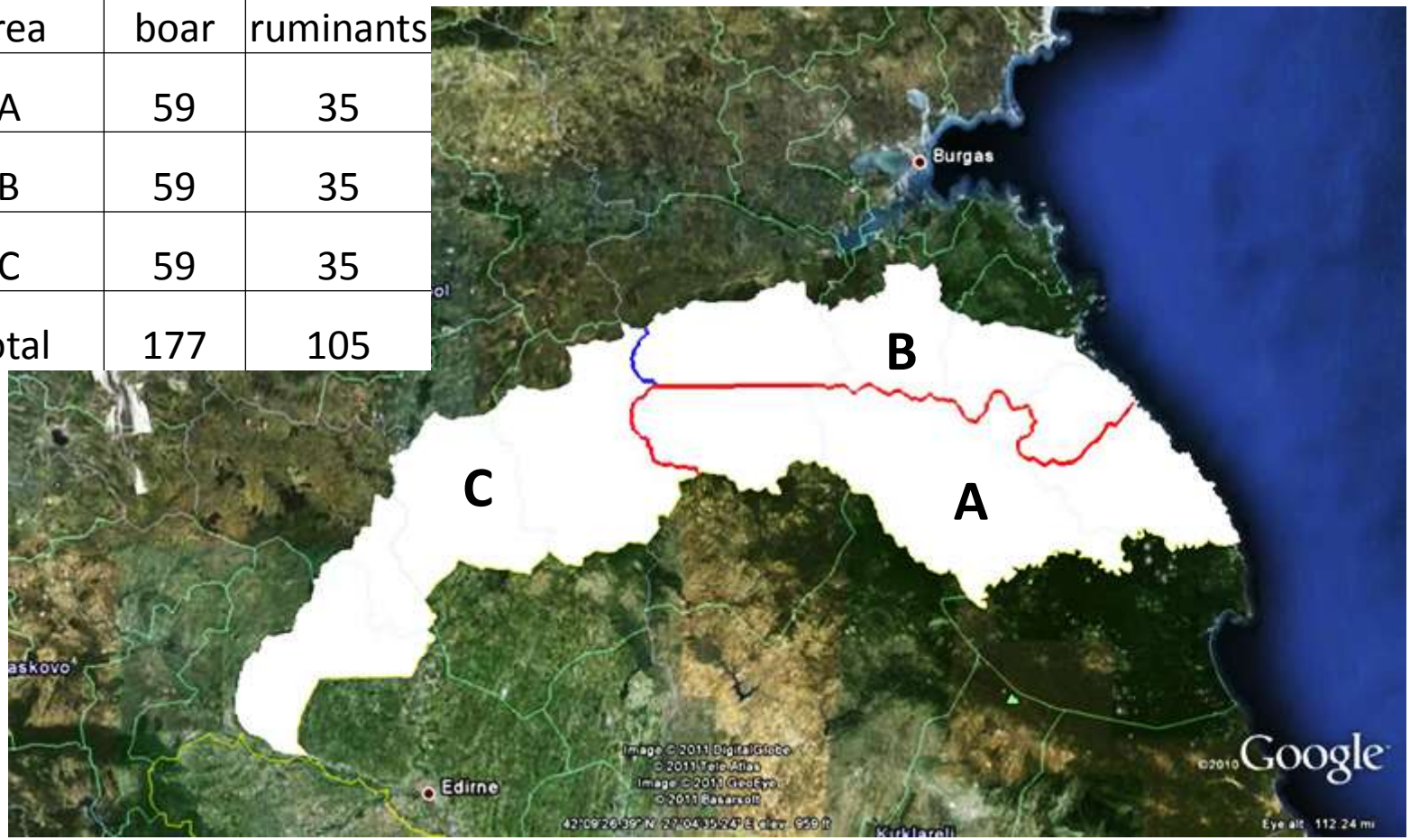




Maps produced by Sergei Khomenko

Surveillance goals

Sampling area	wild boar	wild ruminants
A	59	35
B	59	35
C	59	35
Total	177	105



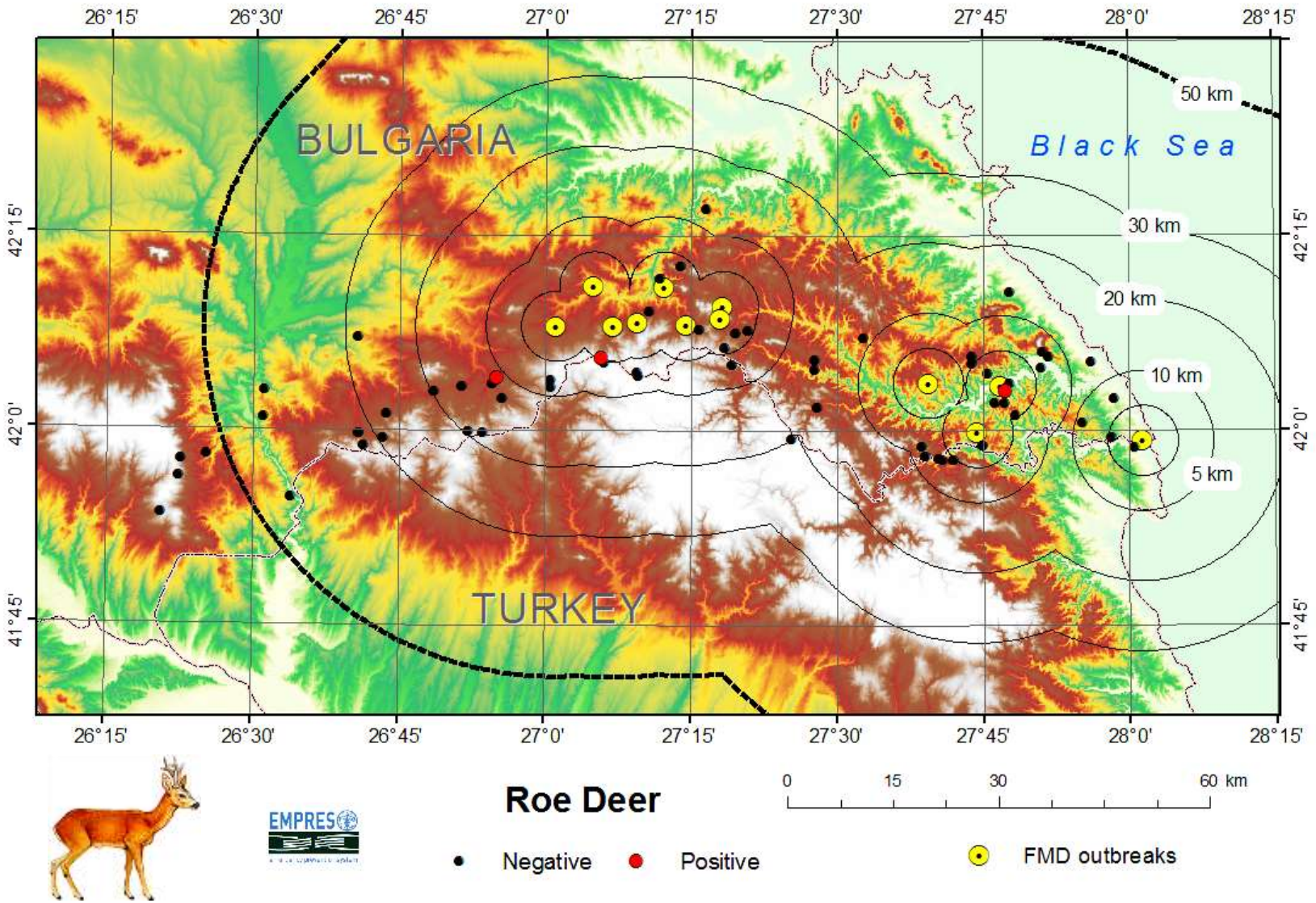
Blood samples for serological testing and tissue samples (tonsils) for PCR have to be taken from every animal

Numbers of wild animals tested monthly in the course of surveillance campaign in Bulgaria during the period from February 2011 to January 2012 by species and age groups.

SPECIES	Age group	Months, 2011:											2011 Total	2012:	Grand Total
		2	3	4	5	6	7	8	9	10	11	12		1	
Wild boar	Adult	5	11			22		7		142	162	160	509	29	538
	Juveniles		1	2		30		11		63	93	50	250	7	257
	NA									17			17		17
	Total	5	12	2	0	52		18		222	255	210	776	36	**812**
Roe deer	Adult	1	5			17		13		4	17	9	66		66
	Juveniles									1	1		2		2
	Total	1	5		0	17		13		5	18	9	68		**68**
Red deer	Adult					2			3	1		1	7		**7**
Mouflon	Adult									2			2		**2**
All 4 species	Total	6	17	2	0	71		31	3	230	273	220	853	36	**889**

No virus detected!



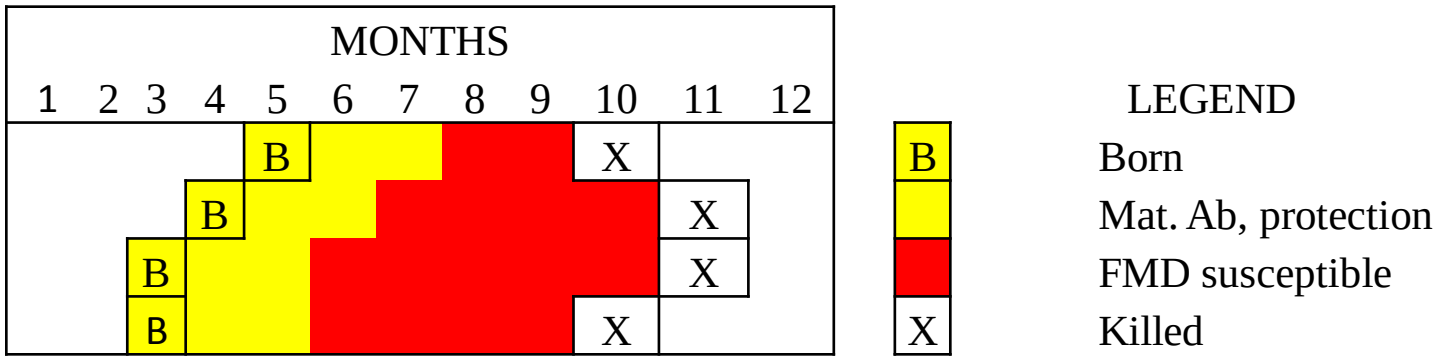



All sero-positive roe deer (n = 3) were adults shot in June near the FMD outbreaks in livestock (~ 5-12 km).

Surveillance in wild boar (*Sus scrofa*), Feb 2011 –Jan 2012

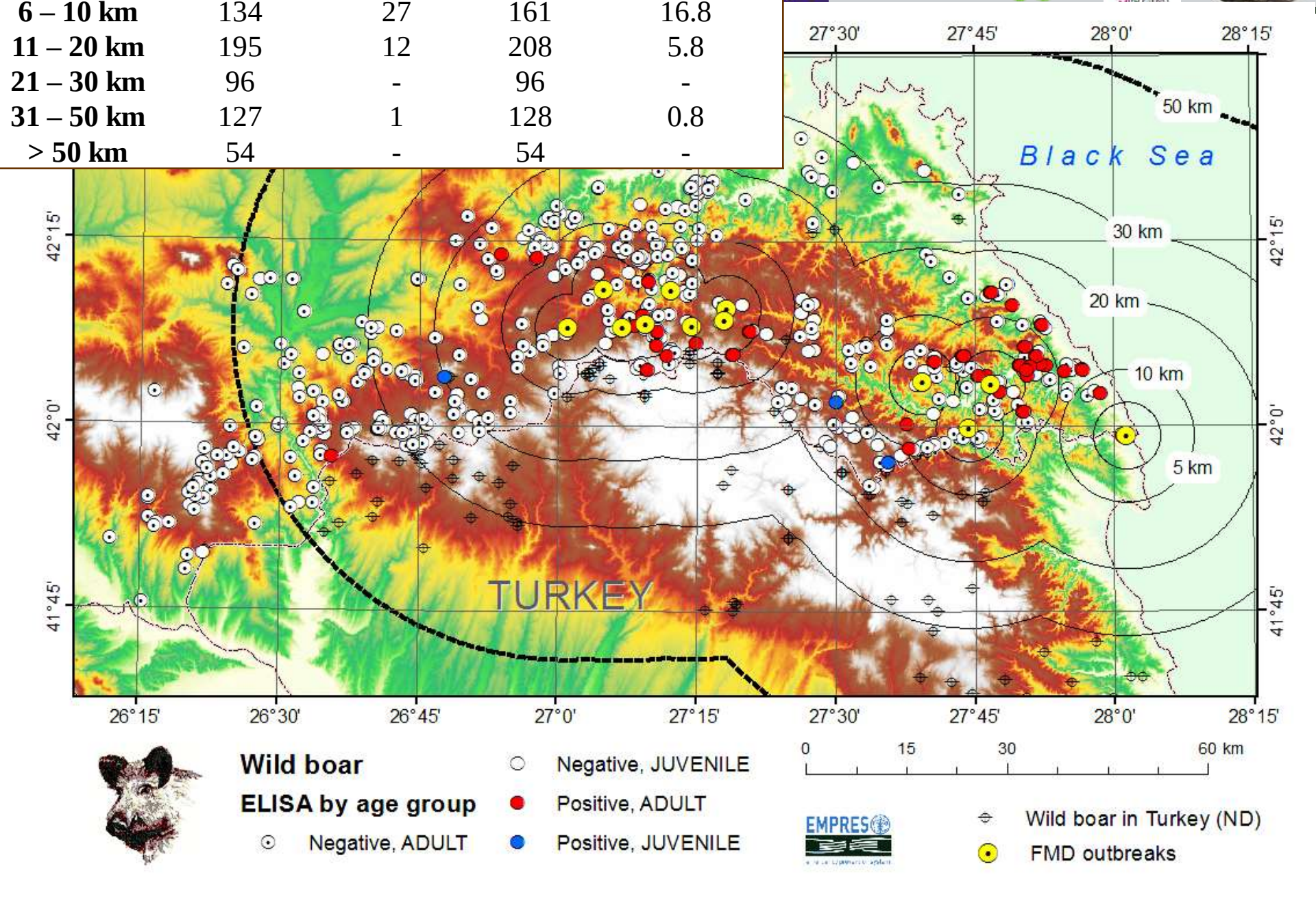
Age groups	Total sampled, n	Ab positive, n	Prevalence (95 % CI), %
Adults	538	51	9.5 (7.1 – 12.3)
Juveniles	257	4	1.6 (0.4 - 3.9)
Age unknown	17	1	5.9 (0.1 – 28.7)
Total	812	56	6.9 (5.2-8.9)

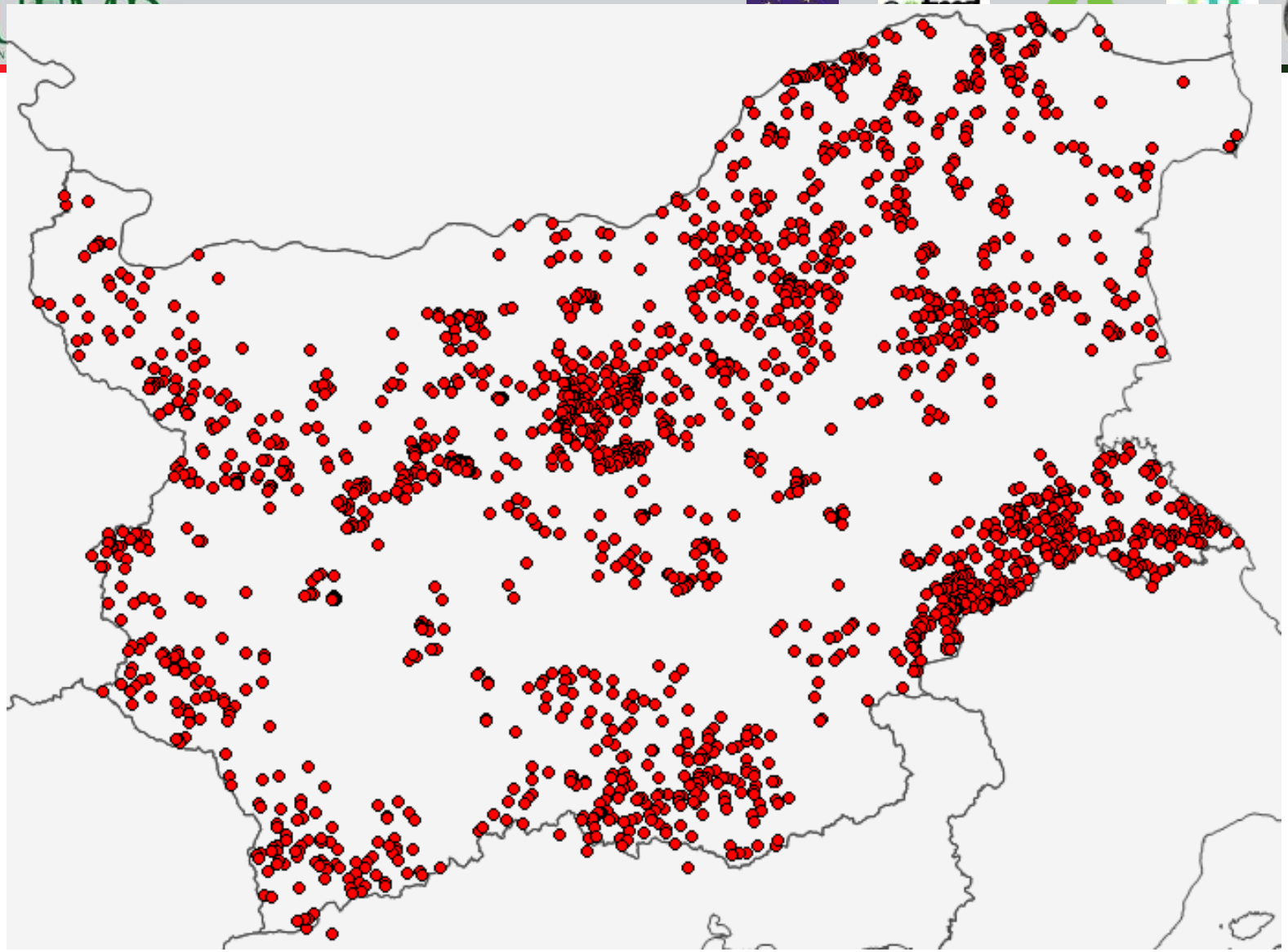
Results of serological surveillance for FMD in wild boar in by age groups



Estimated life spans of 4 sero-positive piglets.

ZONE	Negative, n	Positive, n	Total, n	Prevalence, %
0 – 5 km	149	16	165	9.7
6 – 10 km	134	27	161	16.8
11 – 20 km	195	12	208	5.8
21 – 30 km	96	-	96	-
31 – 50 km	127	1	128	0.8
> 50 km	54	-	54	-





During hunting season 2011 – 2012 (Oct – Jan) 4709 wild boar carcasses from the whole territory of Bulgaria were investigated for lesions and signs suggesting FMD.

FMD or not FMD?

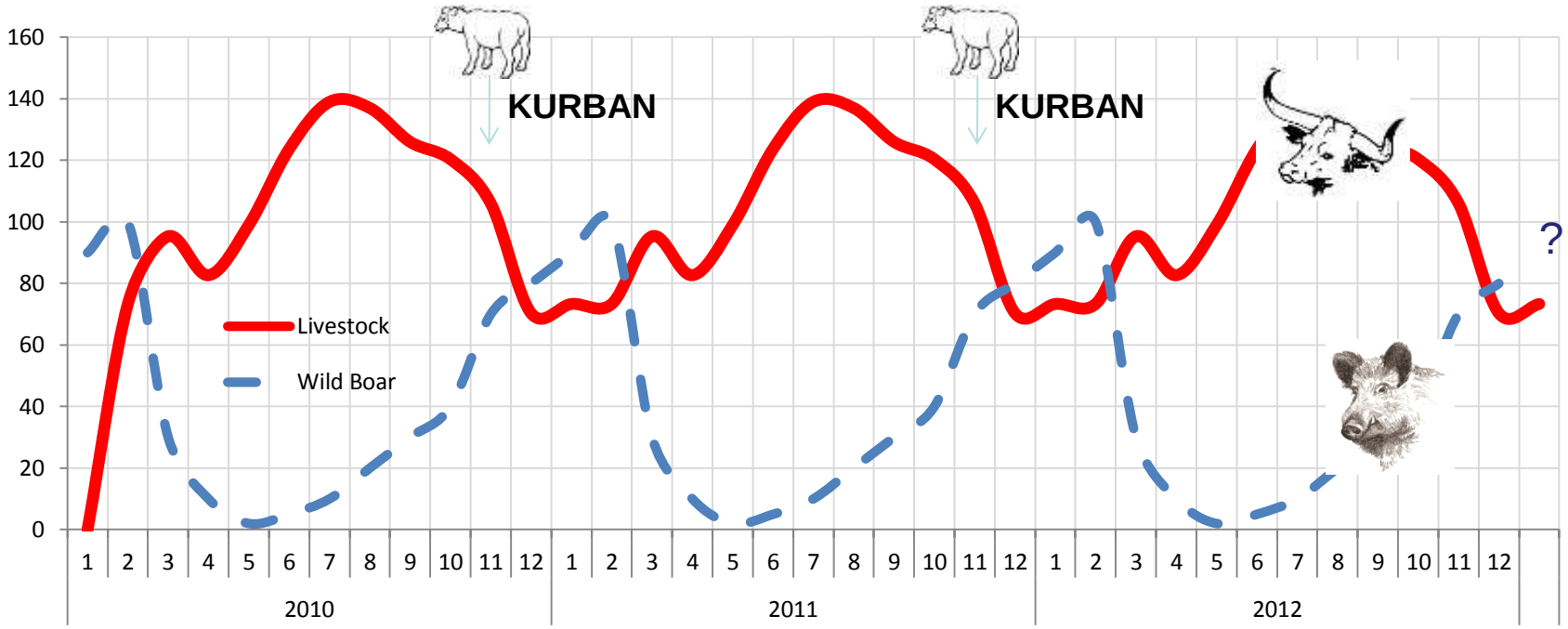
??? Hypothesis outline: ???

- FMD easily spills over to WB from SR (around Kurban?) and develops into epidemics in Nov – March;
- Livestock (summer) and WB (winter) epidemics are in a seasonal in antiphase ("old serotypes" detected);
- Mostly adult animals are involved (rut?);
- Many piglets born thereafter have maternal Ab protection (low prevalence in juveniles);
- This + low population density in early spring + higher temperatures bring R_0 below 1.

***THRACE*: virus O +**

Dec 2010

***BG*:** — O —



Farrowing **Rut** **Farrowing** **Rut** **Farrowing** **Rut**

Scientific Opinion on foot-and-mouth disease in Thrace.

EFSA Journal 2012;10(4): 2635. 91 pp. doi:10.2903/j.efsa.2012.2635
http://www.efsa.europa.eu/en/publications/efsajournal.htm

- Most likely the disease died out in mid-summer 2011, and the areas subject to intensive surveillance both in Bulgaria and Turkey are now free from FMD in wildlife (and domestic animals). This is based on the observations with epidemiological considerations (hot summer in 2011, which was detrimental for environmental survival of FMDV, a relatively low density of wild boar of ~2-3 heads km, absence of clinical signs or virus detections in a considerably large proportion of animals inspected and tested in Bulgaria in October- December 2011 exactly in the former area of the infection, as well as further away in Turkey).
- The epidemiological model indicates that the presence of deer in the populated area does not alter the spatio-temporal dynamics of the infection in the model and that deer alone are not able to facilitate spread of the infection through the whole landscape.
- The epidemiological model indicates that the strong temperature dependence of FMDV survival in the environment explains the seasonal increased chance of virus fade-out.
- The epidemiological model indicates that continued maintenance (e.g. with moderately virulent CSFV in wild boar) cannot be expected from a wild boar + deer host system alone for FMDV. There is need for cross-transmission between wildlife sub-populations due to human movement or cross-transmission to the domestic sector for virus circulation to be maintained.

Conclusions on FMD epidemic in Southeast Bulgaria

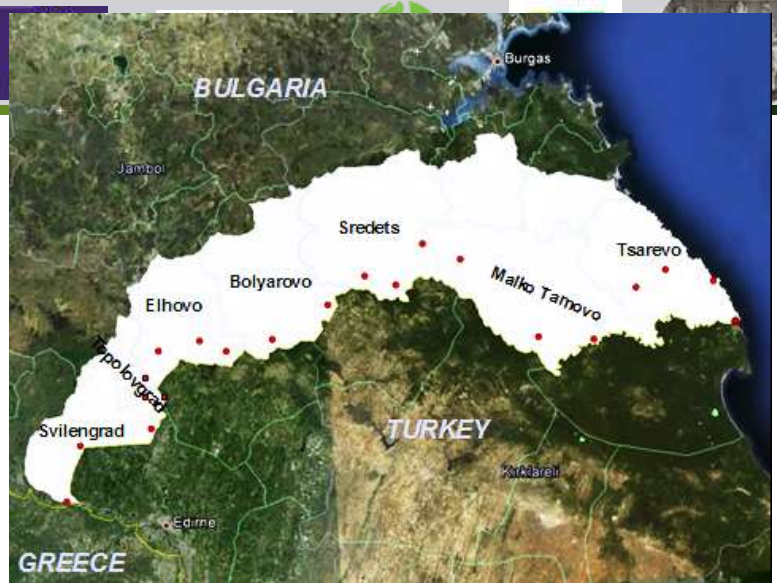
- Spread was spatially and temporary limited;
- Transmission between livestock and wildlife was both ways (facilitated by humans?);
- Disease event in wildlife developed in winter and died away end of spring
- However, serology fails to DATE different stages of this particular disease event …

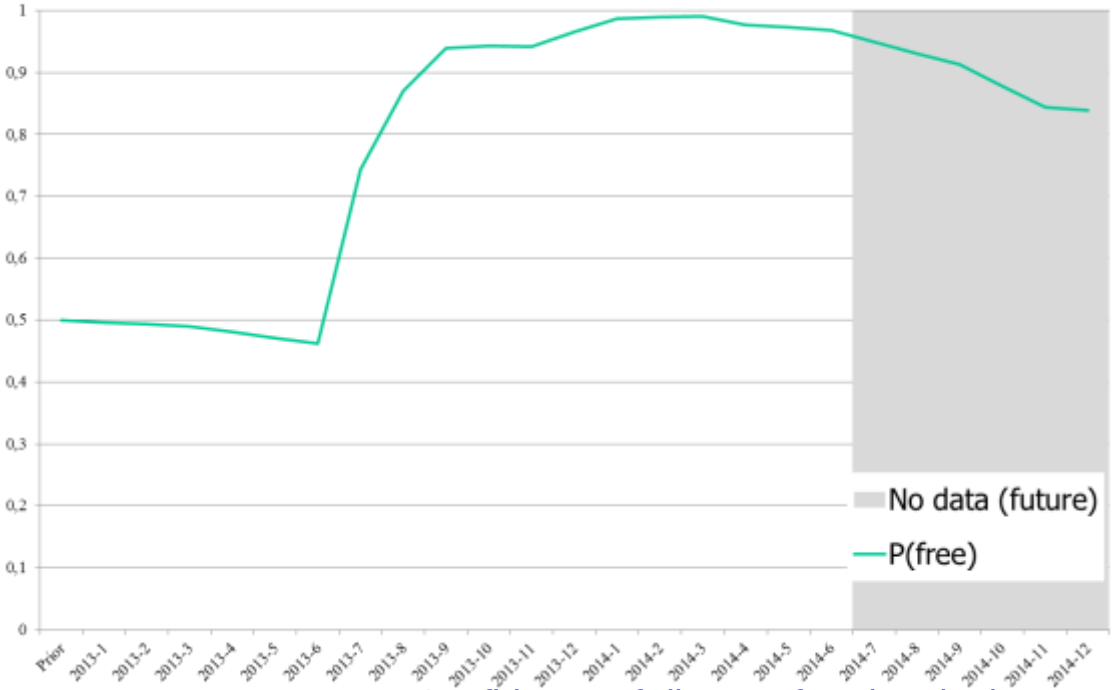
EFSA, 2012; Alexandrov et al, 2013, Dhollander et al (in prep.)

Reinstatement of the FMD free status

- 1st application dossier submitted in Nov 2011
- 2nd application dossier submitted end of May 2012
- Additional information for surveillance on the whole territory of Bulgaria submitted in July 2012
- **31st Aug 2012 - Reinstatement of the free status of Bulgaria – one year and five months after the last outbreak**

- Jan – Apr 2011 – FMD outbreaks
- Apr 2011 – Apr 2012 - Plan for the control of FMD in Southeast Bulgaria – 106 villages
- Apr – Dec 2012 – FMD surveillance programme – 37 villages
- Since 2013 – RBS THRACE programme – 21 villages - Sero-surveillance for FMD and clinical examinations for FMD, SGP, PPR, BT on monthly basis





Confidence of disease freedom in the area
(in grey area the prediction if surveillance activities would stop)

Thanks to all!

BFSA, NRL, EuFMD, EC, EFSA, Turkish colleagues, all veterinarians and hunters involved, Sergei Khomenko, Dimitar Stefanov

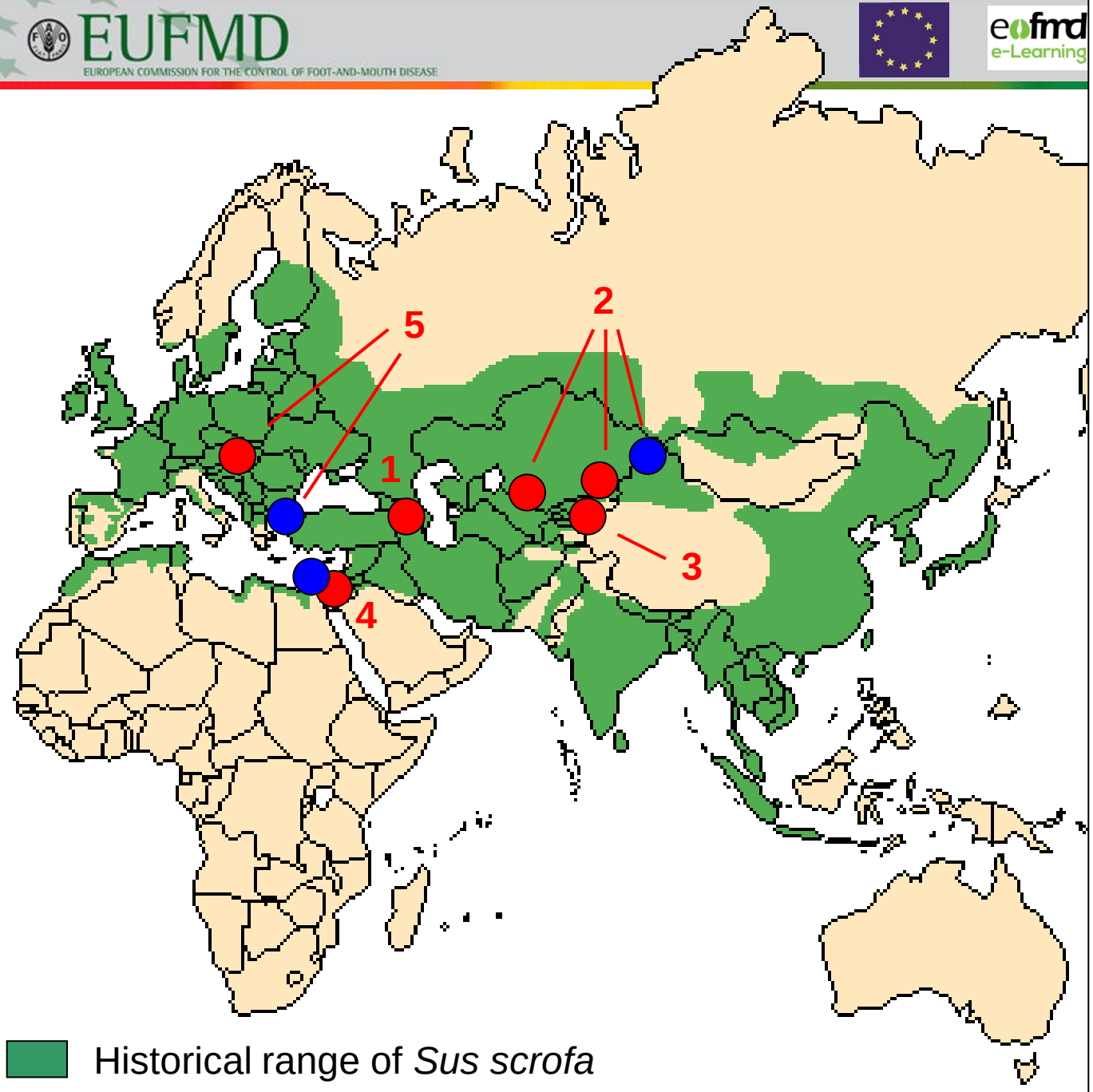
EUFMD
EUROPEAN COMMISSION FOR THE CONTROL OF FOOT-AND-MOUTH DISEASE

When FMD goes wild…

The role of wild boar in FMD disease epidemiology at the wildlife interface with domestic livestock: studies under epidemic and endemic conditions

Keith Sumption, Sergei Khomenko, Sinan Actas Naci Bulut & Tsviatko Alexandrov

Practical Training of Wildlife Surveillance, *Vitoshko-Studena, Bulgaria*, *22-25 Feb 2016*



Historical range of *Sus scrofa*

Marek & Hutÿra, 1931; Sludskiy, 1956; Danilkin, 2002

FMD in wild boar:

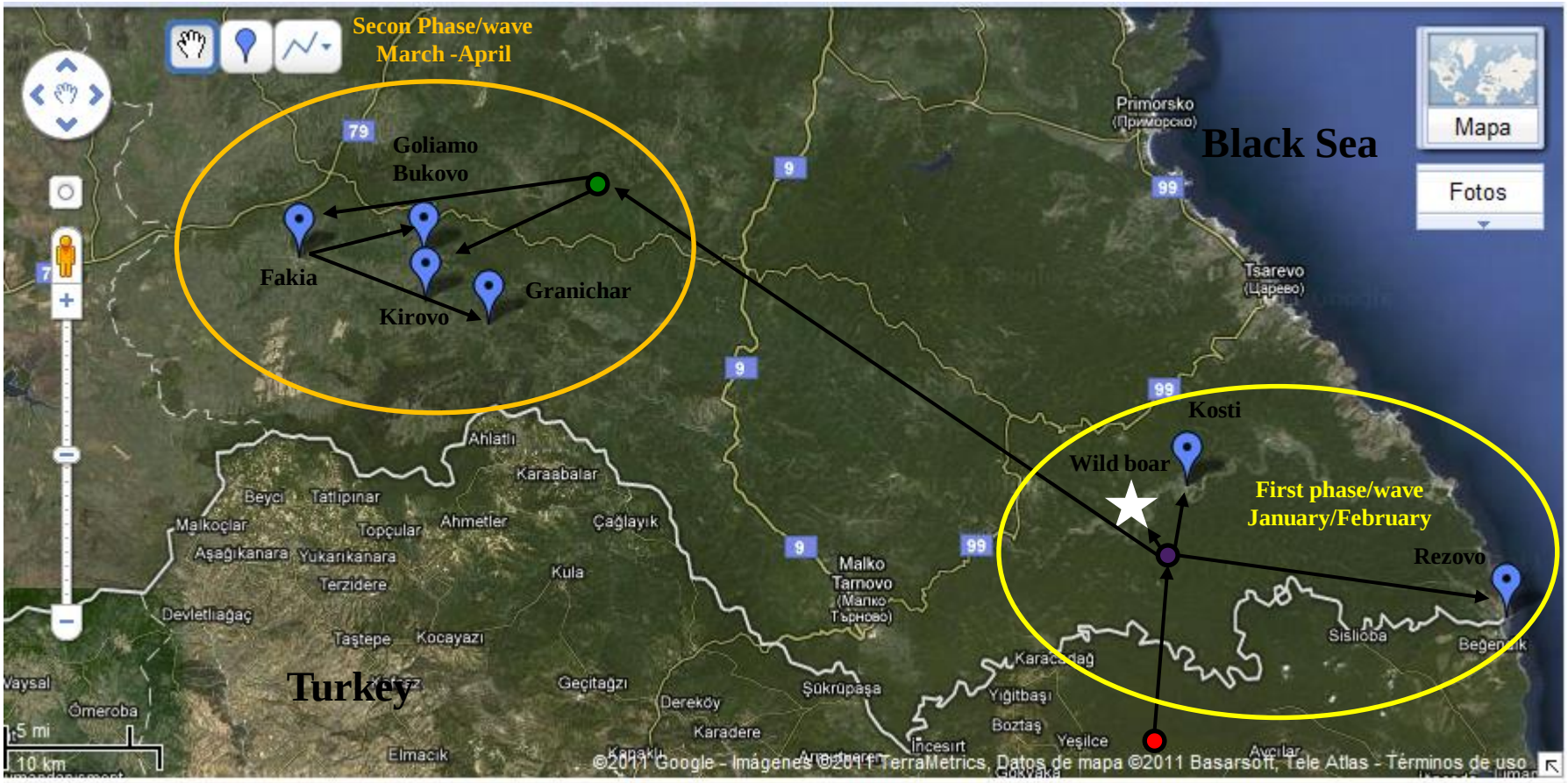
1. Caucasus	1902 1908 1911 1917 1919 1925
2. Kazakhstan	1927 1931 1941 **2011 ?**
3. Kyrgyzstan	1953
4. Israel	1987- 1999 2007 **2011 ?**
5. Europe	1920s? **2011**

Jan 2011. Southeast Bulgaria – first case of FMDV pos. wild boar detected in EU

Many questions raised!

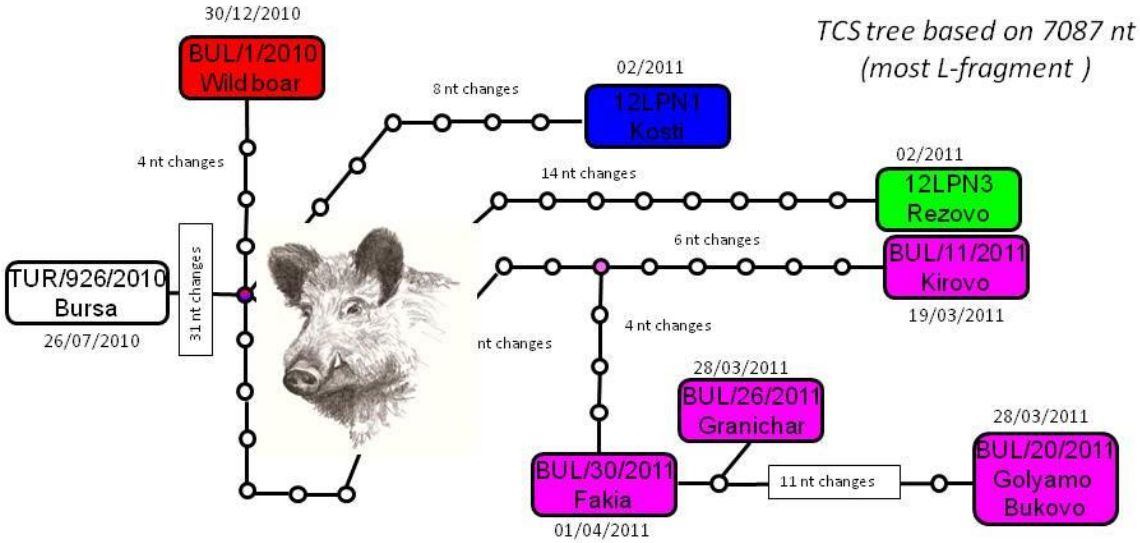
Wild boar - victim or guilty?

Bulgarian FMD epidemic: many missing links between the waves of domestic animal cases



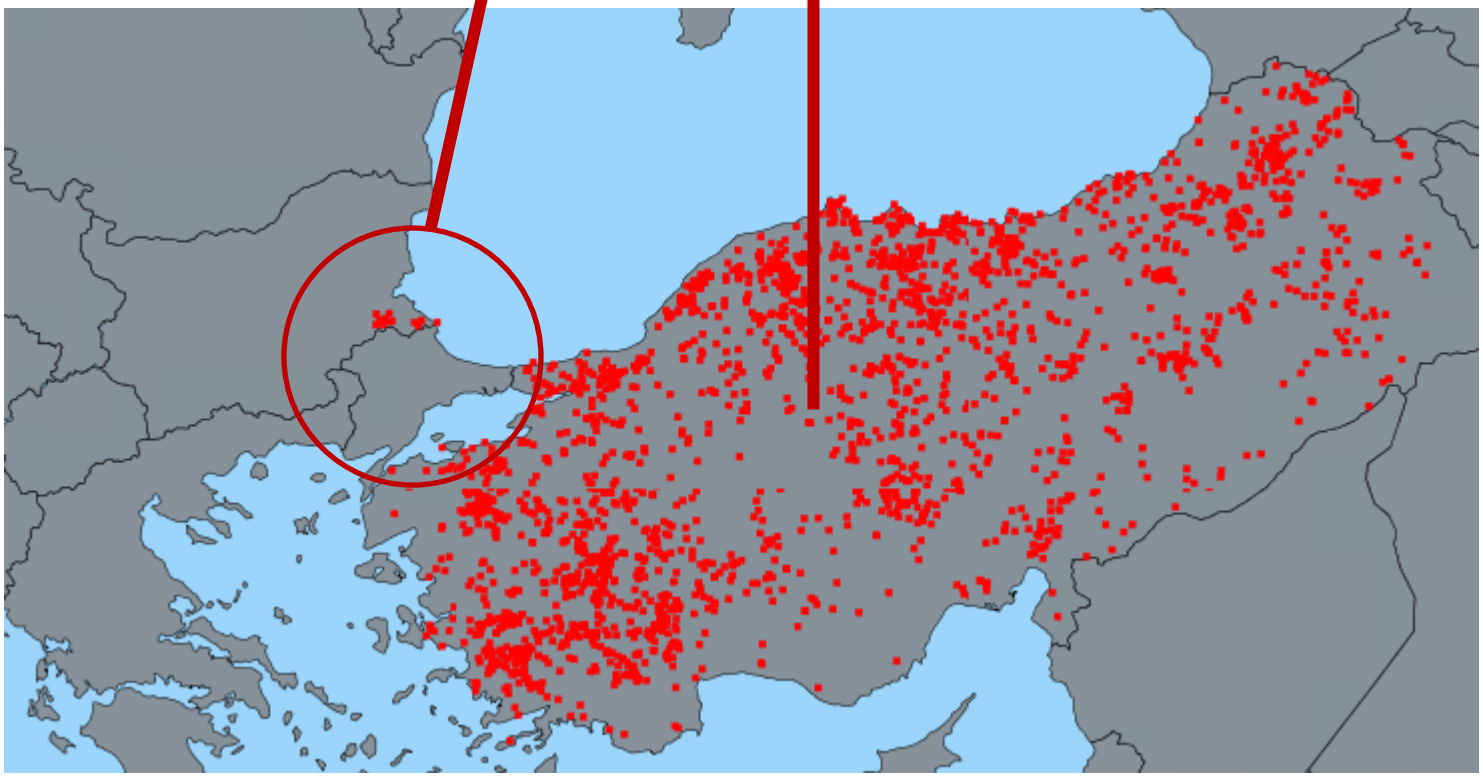
FMD virus genome sequencing: evidence for undetected transmissions – did these occur in wild life?

***Credit**: **Begoña Valdazo-Gonzalez**, Nick J. Knowles, Donald P. King*



- Putative common ancestor of Bulgarian wild boar and first phase of the outbreaks
- Putative common ancestor of the second phase of the Bulgarian outbreaks

Thrace vs Anatolia



FMD outbreaks Oct 2010 – Mar 2012, Source ADNS

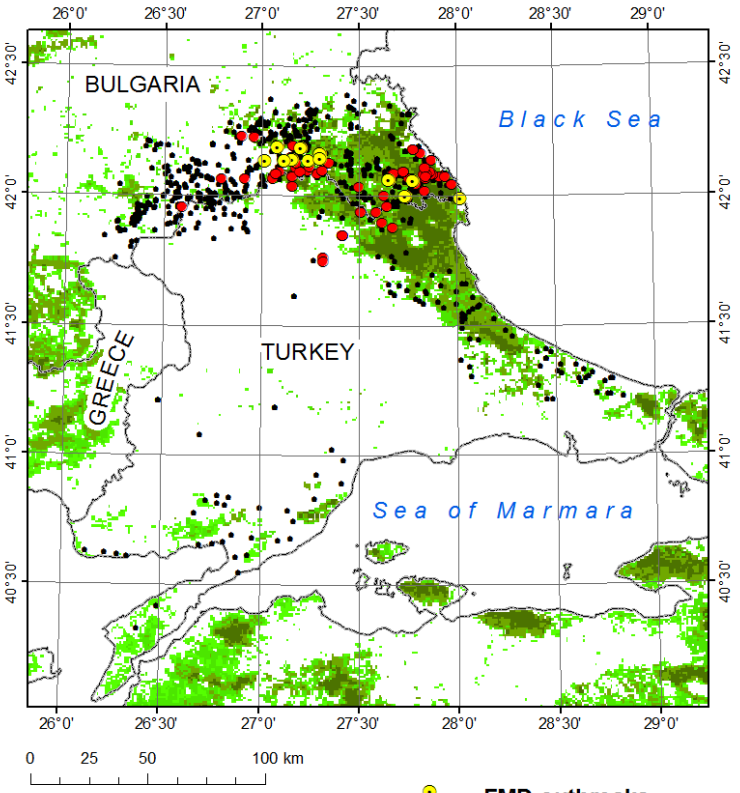
- How frequent is FMD spill over to wild boar? Studies in Bulgaria and Turkey (Thrace and Anatolia, 2011-12)
- Experimental infection of wild boar and domestic pigs with FMD, study by FLI

- Clinical signs on the 4 DPI (domestic 2 DPI) – e.g. incubation 4 days;
- Most severe and evident lesions – 7 DPI;
- Viraemia: 1 DPI through at least 9 DPI;
- NSP antibodies detected 7-8 DPI;
- RNA in saliva normally found up to 14 DPI and up to DPI 24 DPI intermittently.
- Wild boar do not play an important role as virus carriers.

(a–e) Lesions after FMDV type O infection of wild boar. Vesicles on the dorsum of the snout (a) and the interdigital space (b), 4 DPI. Ruptured vesicles on the heel 8 DPI (c) and 28 DPI (d). Serofibrinous infilling in the interdigital space, 8 DPI (e). Claw deformation after coronary band lesions, 28 DPI (f).

Breithaupt, A., et al., Experimental infection of wild boar and domestic pigs with a Foot and mouth disease virus strain detected in the southeast of Bulgaria in December of 2010. Vet. Microbiol. (2012), doi:10.1016/j.vetmic.2012.03.021

Surveillance in wild boar for FMD 2011-2012

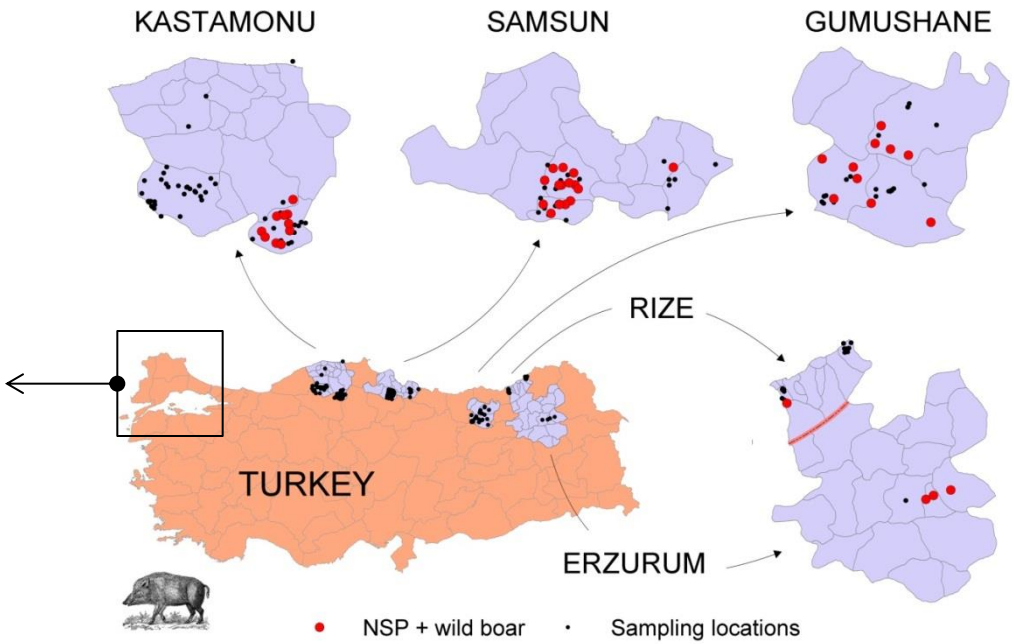


FMD outbreaks

FOREST COVER
%
- 0
- 1 - 28
- 29 - 48
- 49 - 67
- 68 - 80

Sample collection sites

ELISA results
- Negative
- Positive

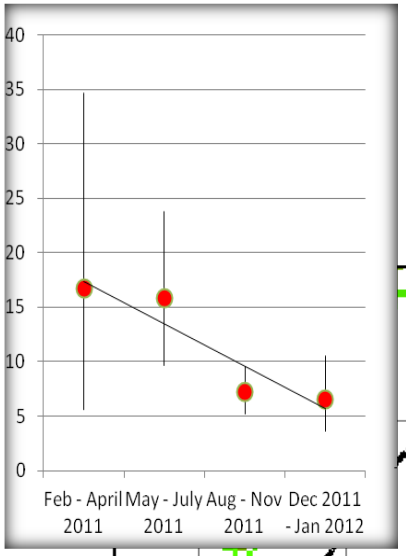


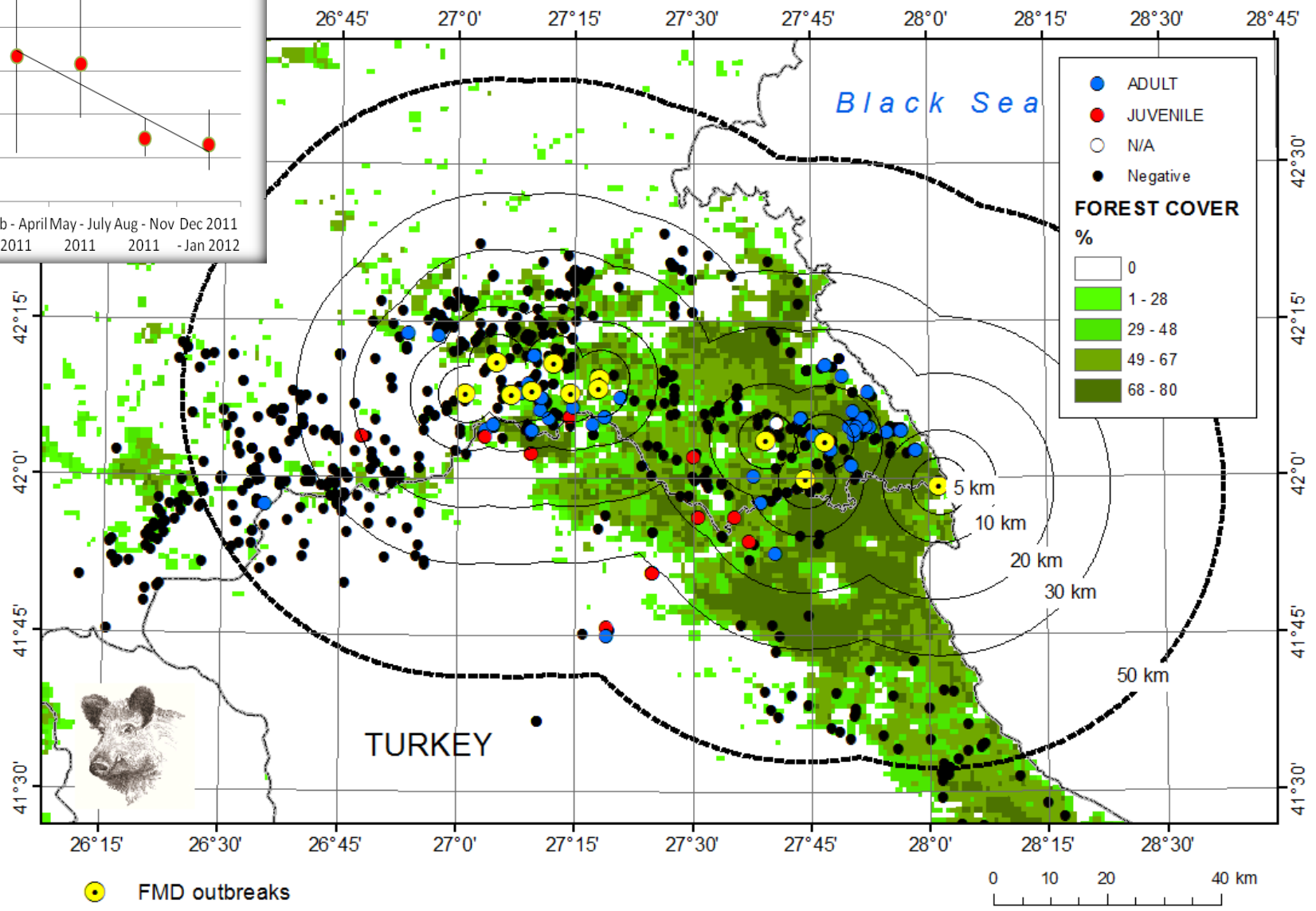
ANATOLIA (TR)
Dec 2011 – Feb 2012, N=252

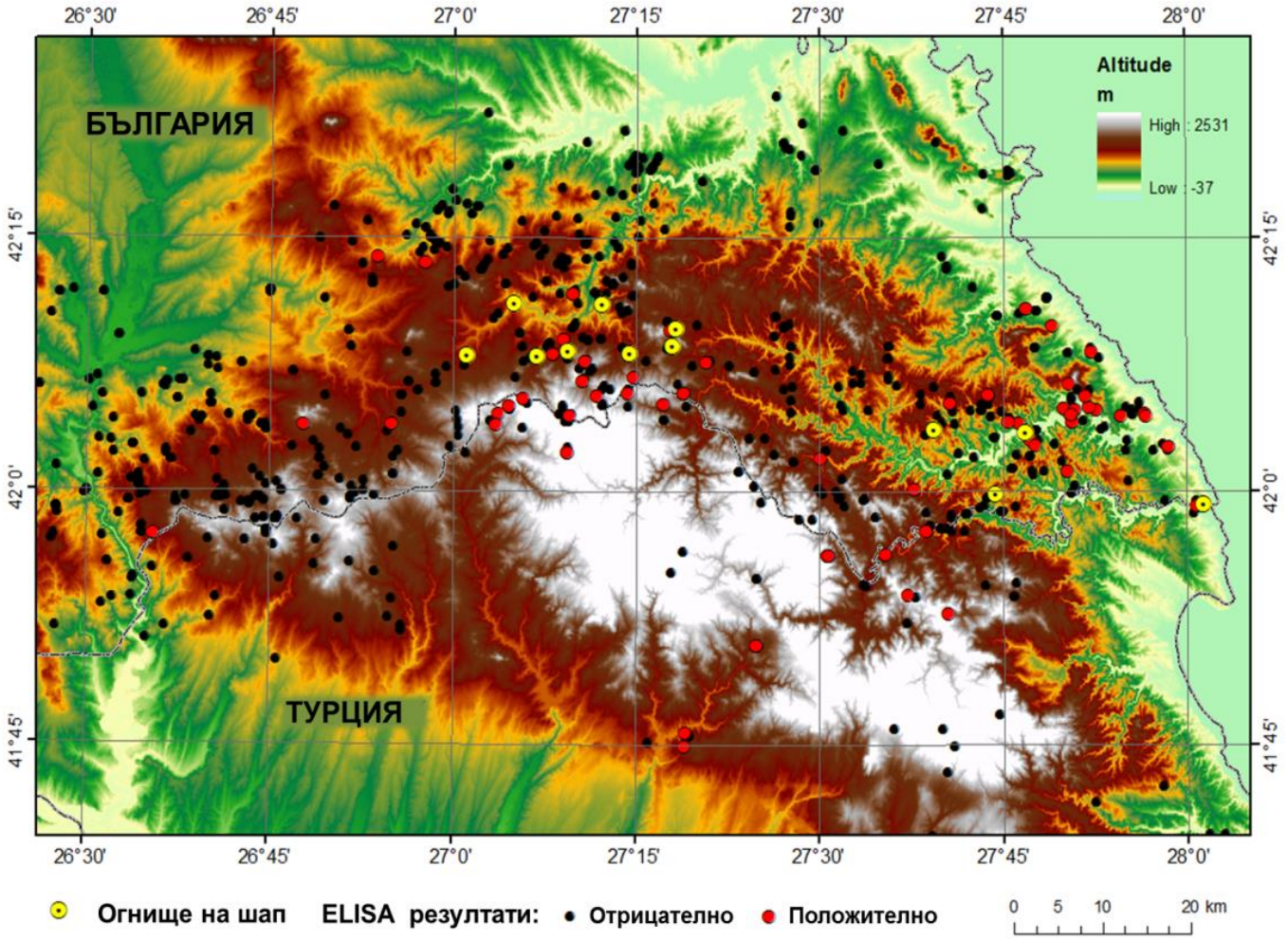
THRACE (BG+TR)
Jan 2011 – Jan 2012
N=1004

AGE GROUP	THRACE		ANATOLIA		P
	n	NSP+ (95 % CI), %	n	NSP+ (95 % CI), %	
ADULT	628	9.1 (6.9 – 11.6)	185	24.9 (18.3 - 32.4)	<0.05
JUVENILE	358	5.6 (3.4 – 8.5)	67	7.5 (2.5 - 16.6)	ns
ALL	1004	7.8 (6.2-9.6)	252	20.2 (15.5 - 25.7)	<0.05

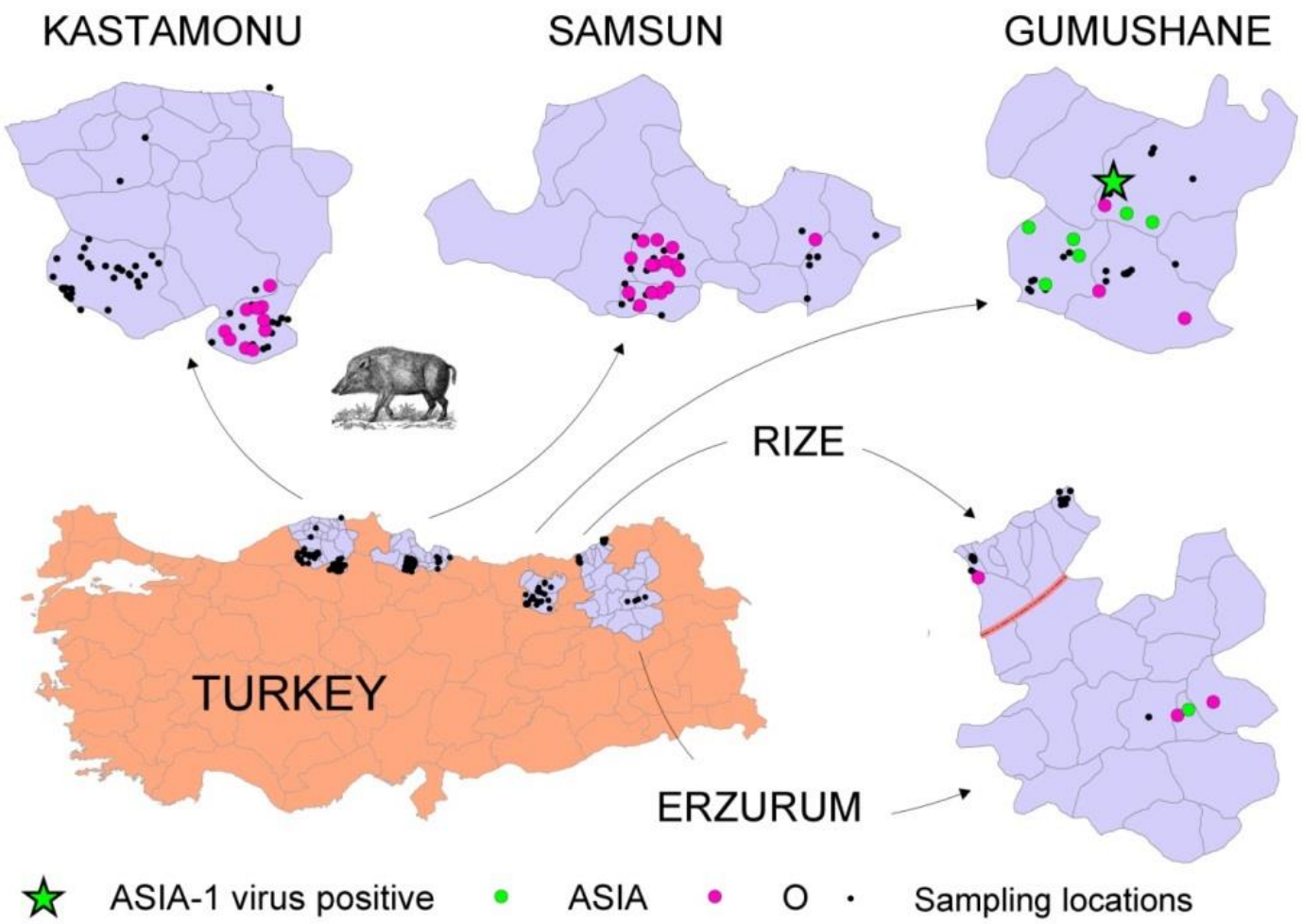
Sero-surveillance in Wild Boar in Thrace

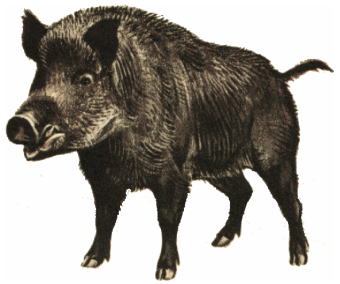






Age group	Bulgaria		Turkish Thrace	
	Tested, n	Ab +/ %	Tested, n	Ab +/ %
adults	538	51/9.5%	46	11/23.9%
juveniles	257	4/1.6%	52	16/30.8%
unknown	17	1/5.9%	-	-
Total	812	56/6.9%	98	27/27.6%





60,000

infected with FMD ?

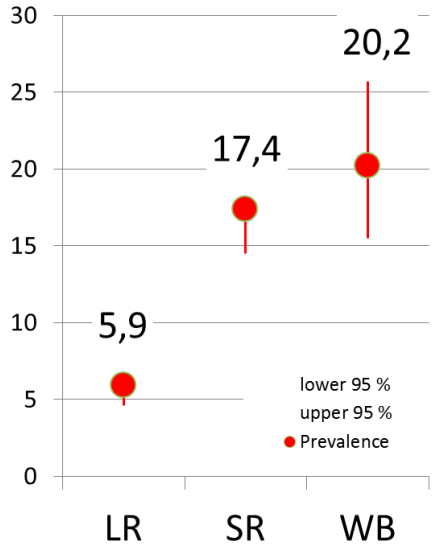
Region	n	% NSP+ (95 % CI)	% ASIA +	% O +
ERZURUM	17	**52.9** (27.8 - 77.0)	11.8	41.2
SAMSUN	73	**28.8** (18.8 – 40.6)		28.8
GÜMÜŞHANE	58	**17.2** (8.6 – 29.4)	12.1*	5.2
KASTAMONU	76	**13.2** (6.5 – 22.9)		13.2
RİZE	21	**4.8** (0.1 – 23.8)		4.8
TOTAL	252	20.2 (15.5 – 25.7)	3.6	16.7

NO SEROTYPE “A” FOUND, but “O” and “Asia-1” were found in exactly the same proportion as in livestock

Average FMD seroprevalence in wild boar compared to that in small and large ruminants (2010) by the 5 study provinces of Anatolia.

Province	Wild boar NSP+		Small ruminants NSP+		Large ruminants NSP+		Significance of difference, P	
	n	% [95 % CI]	n	% [95 % CI]	n	% [95 % CI]	WB v SR	WB v LR
Erzurum	17	52.9 [28 - 77]	329	49.5 [44 - 55]	496	10.7 [8 - 14]	0.809	< 0.0001
Gumushane	58	17.2 [9 - 29]	224	13.8 [10 - 19]	216	10.6 [7 - 16]	0.5324	0.1771
Kastamonu	76	13.2 [7 - 23]	448	10.3 [8 - 14]	496	3.2 [2 - 5]	0.426	0.0009
Rize	21	4.8 [0.1 - 24]	256	3.5 [2 - 7]	248	2.0 [1 - 5]	0.5516	0.3889
Samsun	73	28.8 [17 - 41]	703	10.0 [8 - 12]	682	3.1 [2 - 5]	0.0001	< 0.0001
Total	**252**	**20.2 [16 - 26]**	**1960**	**17.4 [15 - 18]**	**2138**	**5.9 [5 - 7]**	**0.0877**	**< 0.0001**

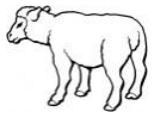
- Distinctly different from LR (P=0.1), but not SR (P=0.001);
- Except for Samsun prevalence in WB does not differ from SR (P=0.6-0.8);
- Prevalence in WB correlates best with that in SR (r=0.9, R^2 = 0.8), but not LR (ns).



THRACE

Serotype

O

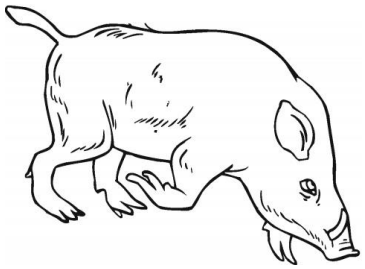


- Closely related isolates from cattle
- Isolates from wild boar

ANATOLIA

Serotype

Asia-1



Implications for disease surveillance and control

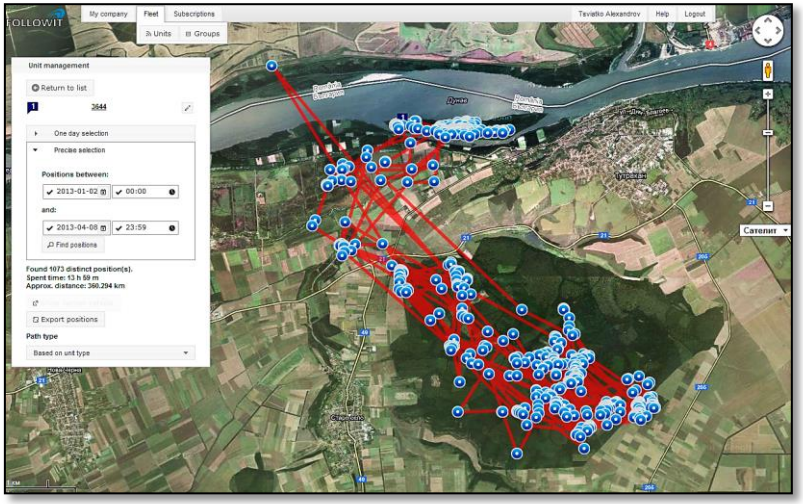
1. FMD spillover to wild boar is a frequent event
2. Infection in WB correlates with disease occurrence in livestock, particularly in SR.
3. Spillovers may develop into localised epidemics (3-6 months) affecting up to 20 % of the population and virus spread for to 15-20 km
4. Winter is most risky period for horizontal transmission of FMD in wild boar population;
5. Different serotypes may perform differently in wild boar;
6. Even rather localised FMD spread through wild boar population has a potential to introduce the virus to a previously unaffected area and deliver it to immunologically naive domestic animals, either through direct, or indirect wildlife-livestock interactions, or by hunting infected wild animals.

Recommendations

- The FMD prevention, control and eradication measures have to account for possible wild boar involvement and its likely contribution to FMD transmission cycle and spread.
- Such sylvatic FMD epidemics should be of particular concern on the borders between countries or regions with different FMD status or control strategies (e.g. FMD free, free with vaccination, vaccination applied, FMD endemic).
- In order to anticipate future risks of FMD introductions in such areas regular seasonal surveillance in wild boar populations is recommended.

Acknowledgements:

- the support that was provided rapidly from DG-SANTE through the EuFMD Research Fund to enable field studies.
- The Governments of Turkey and Bulgaria and FLI



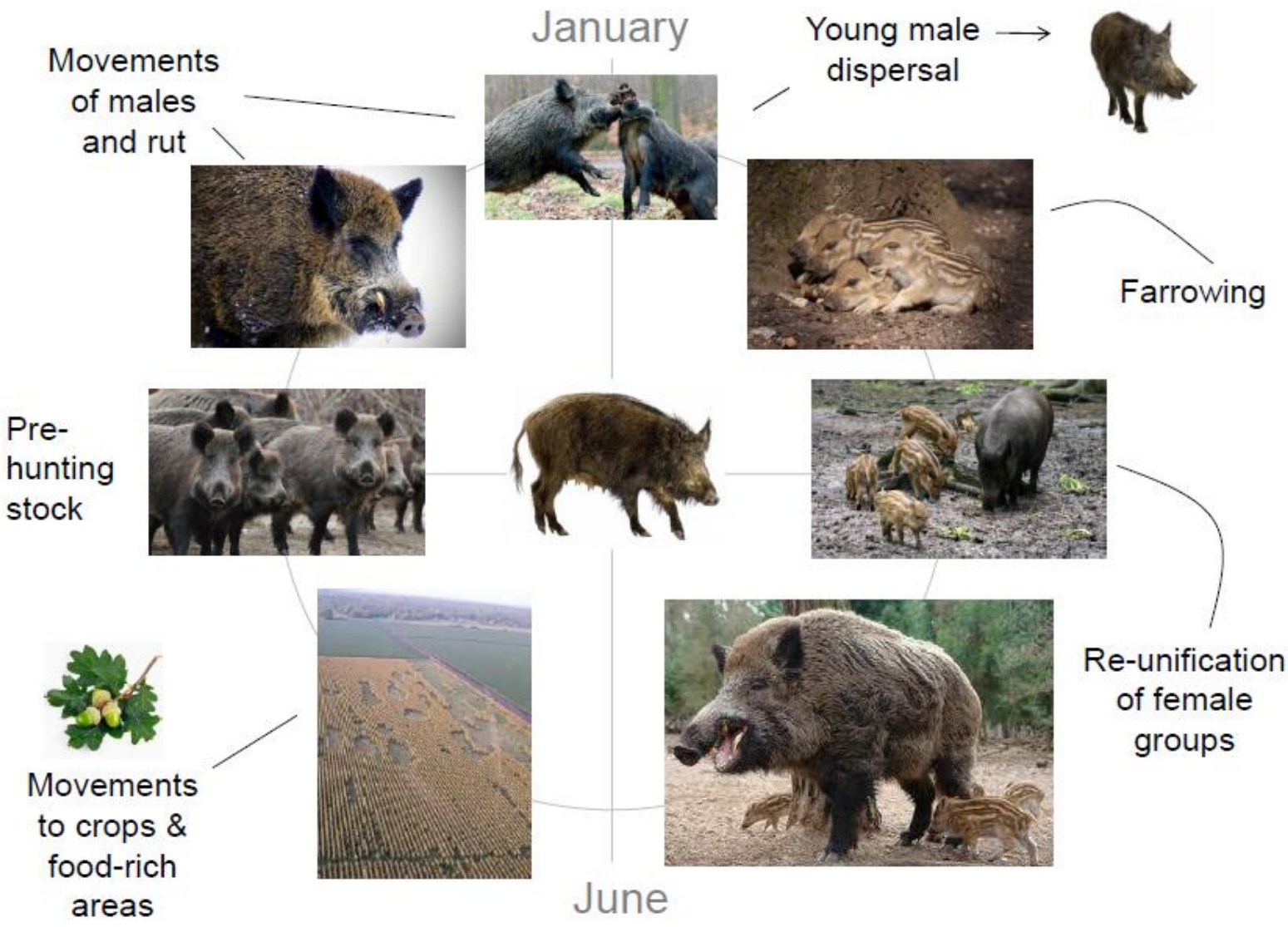
Wild boar ecology and disease

space use and social interactions in a wild boar population

Keith Sumption, Sergei Khomenko,
Dimitar Stefanov &
Tsviatko Alexandrov

Practical Training of
Wildlife Surveillance,
Vitoshko-Studena, Bulgaria,
22-25 Feb 2016

Use local expertise on expected local movements



Telemetry project

- 20 GPS/GSM Tellus collars (1 year – 24 fixes a day);
- 19 animals collared, 16 collars used (6 reused), 4 were destroyed / failed, 1 lost;
- Sex, age, and seasonal variation in home ranges;
- Individual movements and group interactions in a small population (70 animals) to simulate disease spread.

- Strandzha – 4 (2)
- Tutrakan – 15 (7)

http://www.followit.se/wildliferesearch.html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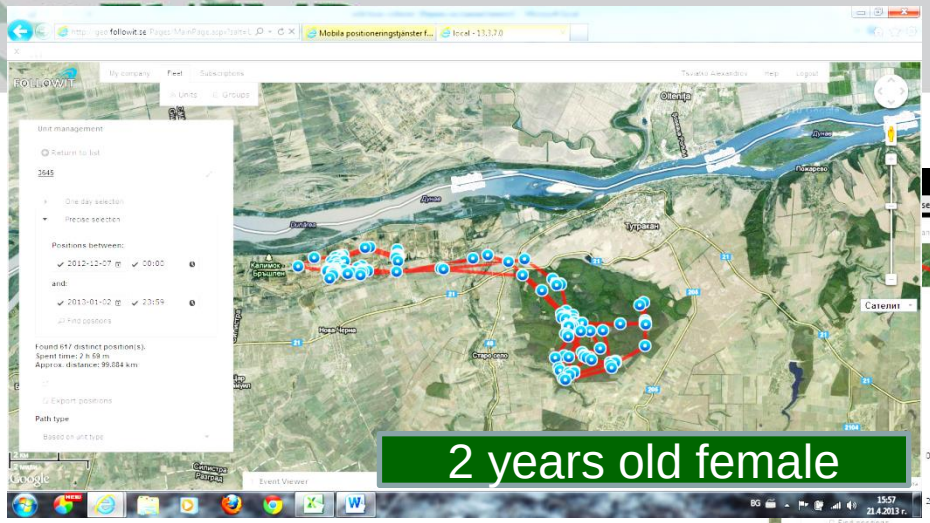
Zoletil 100
ANESTÉSICO GENERAL PARA CARNÍVOROS DOMÉSTICOS
USO VETERINARIO

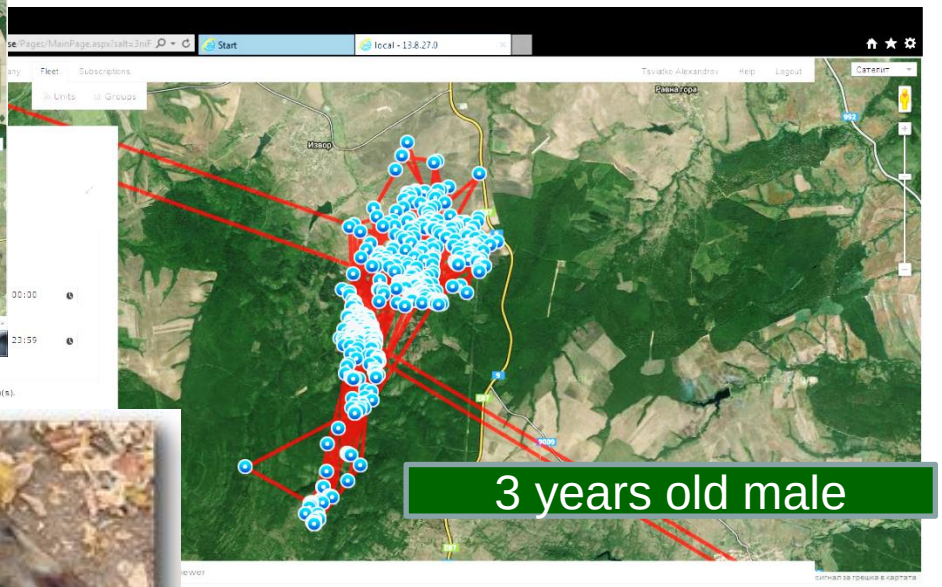

ВИСОКО НАПРЕЖЕНИЕ
ОПАСНО ЗА ЖИВОТА

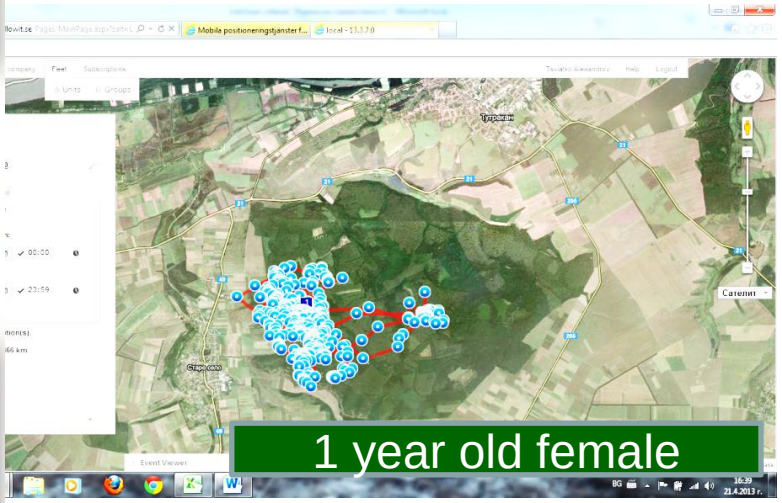

ВИСОКО
НАПРЕЖЕНИЕ
ОПАСНО ЗА ЖИВОТА

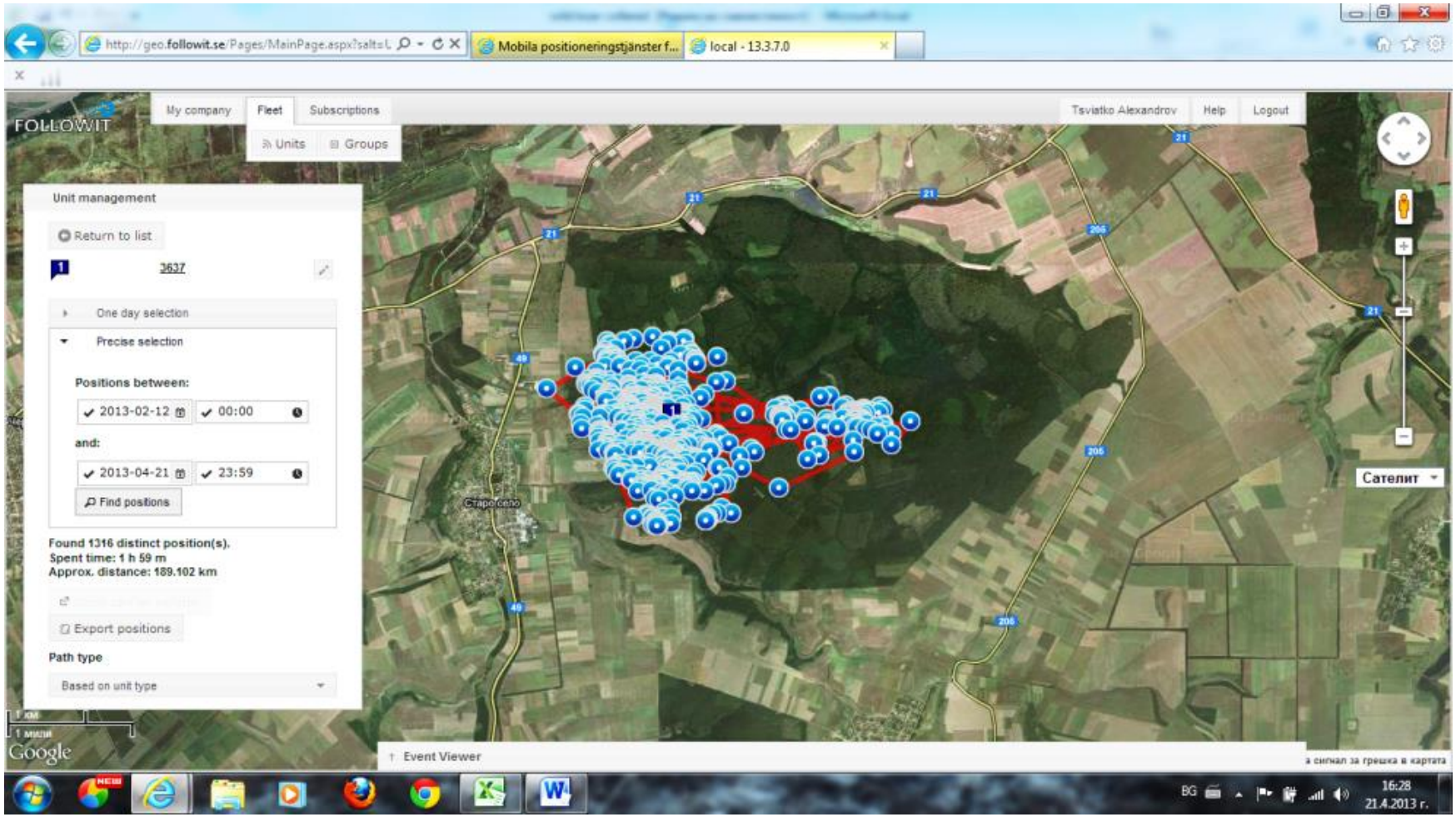
Wild boar tracked in Bulgaria for the period 31.06.2012 – 31.12.2013

WB	Collar ID	Date of collaring	sex	Age/ years	Region	Positions, n	Home range, km^2
1	3626	31.06. 2012	f	2	Strandzha	No info	NA
2	3631	27.09.2012	m	2	Strandzha	1188	24
3	3632	7.10.2012	f	2	Tutrakan	70	NA
4	3642	21.10.2012	m	4	Tutrakan	1616	6
5	3628	28.10.2012	f	2	Tutrakan	No info	NA
6	3641	03.11.2012	m	1	Tutrakan	2260	9
7	3643	03.11.2012	m	1	Tutrakan	105	NA
8	3628	04.11.2012	m	1	Tutrakan	921	20
9	3629	07.11.2012	m	2	Strandzha	8400	> 40
10	3645	07.12.2012	m	2	Tutrakan	653	30
11	3643	07.12.2012	m	2	Tutrakan	272	30
12	3633	19.12.2012	f	3	Strandzha	3707	8
13	3644	02.01.2013	m	4	Tutrakan	2299	37
14	3632	02.01.2013	f	1	Tutrakan	3673	9
15	3637	12.02.2013	f	4	Tutrakan	2149	7
16	3636	13.02.2013	f	5	Tutrakan	1668	22
17	3638	14.03.2013	f	5	Tutrakan	495	5
18	3630	14.03.2013	m	1	Tutrakan	941	7
19	3640	14.03.2013	f	7	Tutrakan	No info	NA


2 years old female

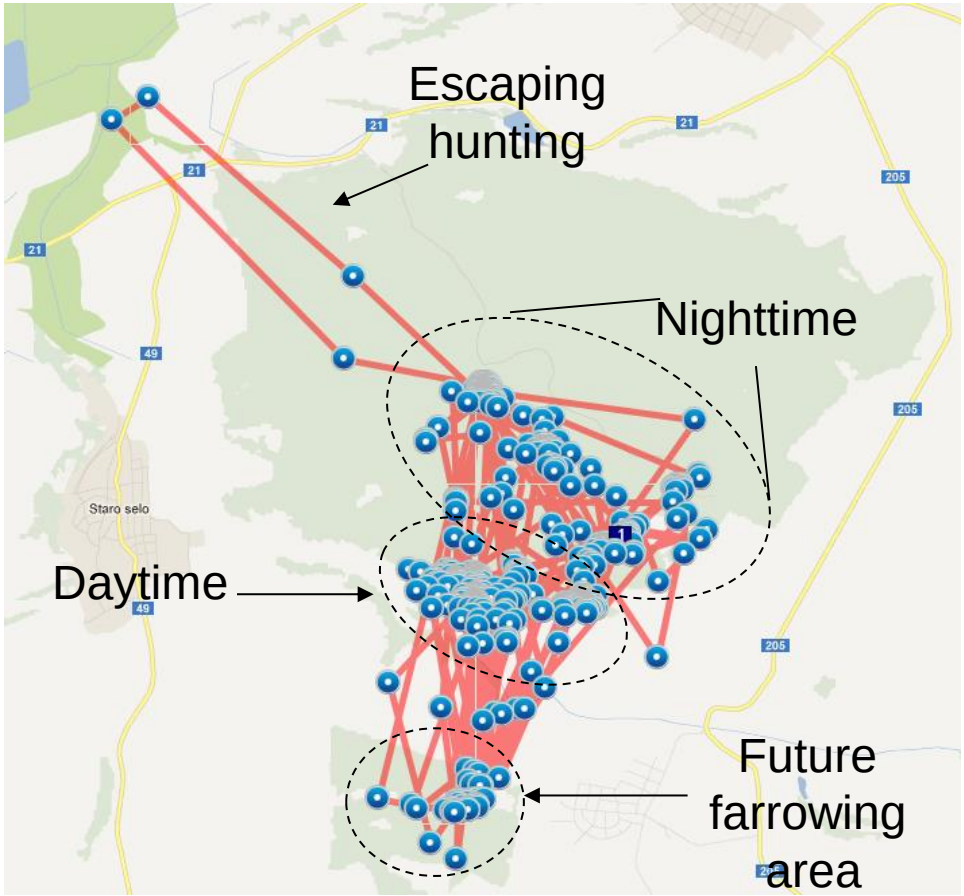

3 years old male


1 year old female



4 years old female
Tracked for 87 ддays: 12.02.2013 – 10.05.2013 г.
Positons received: 2149
Home range: 7 km^2

natural territoriality and anticipated local movements. Avoid dispersion peace time or crisis.



1 hour resolution movements of a tracked wild boar saw in Bulgaria

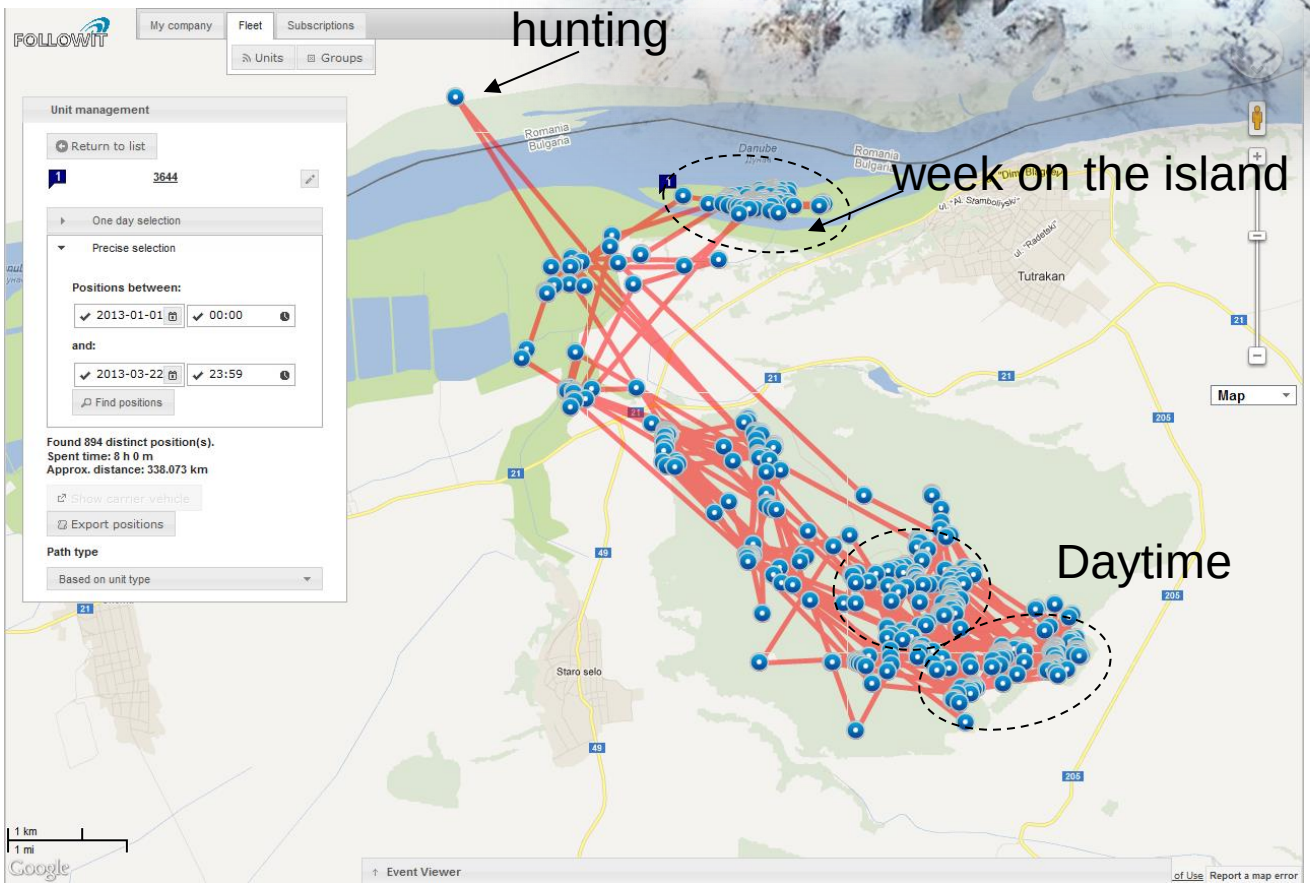
- WB normally very small home ranges (4 - 20 km^2);
- Very boring schedules ☺
- Disrupted by only food availability or disturbance

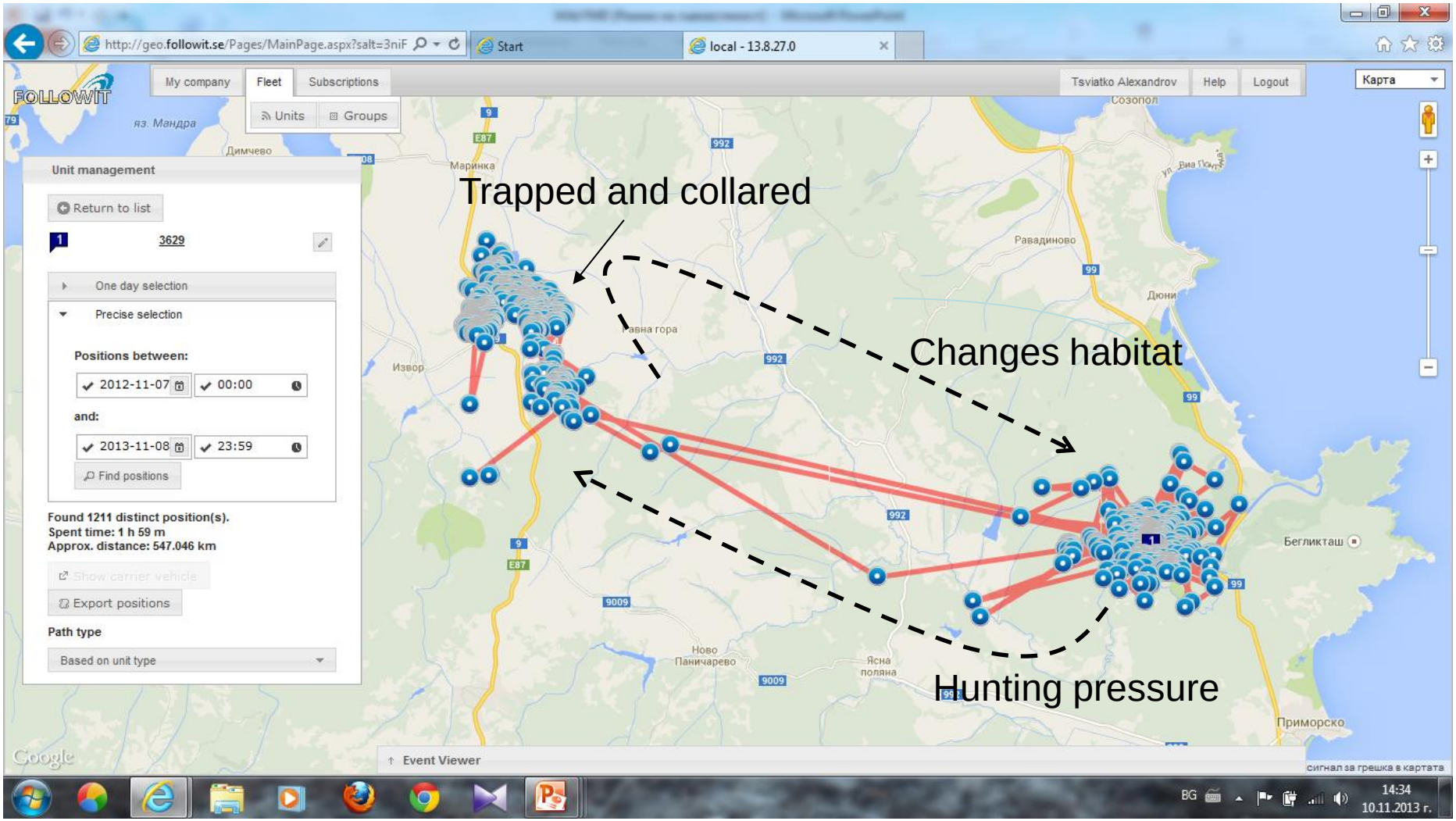
Tracking: year round study

Valuable insights on potential spillovers – but very hard to use in a crisis

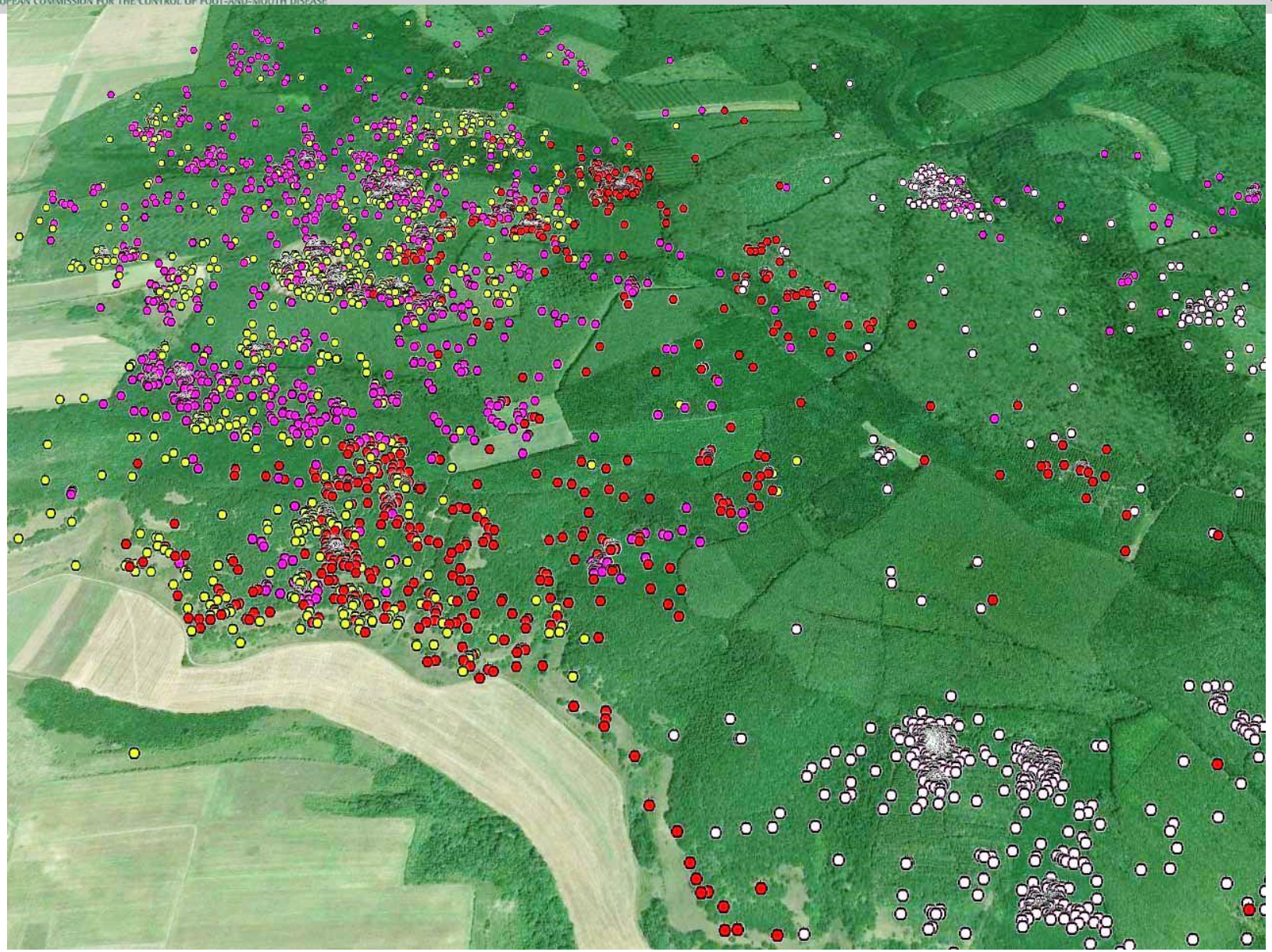
4-year male, 1 Jan - 22 March – 894 positions –a total of 338 km

Crossed Danube into Romania one occasion





Two years old male in Strandzha – 7 Nov 2012 – 8 Nov 2013



4 different groups of wild boar overlapping…..

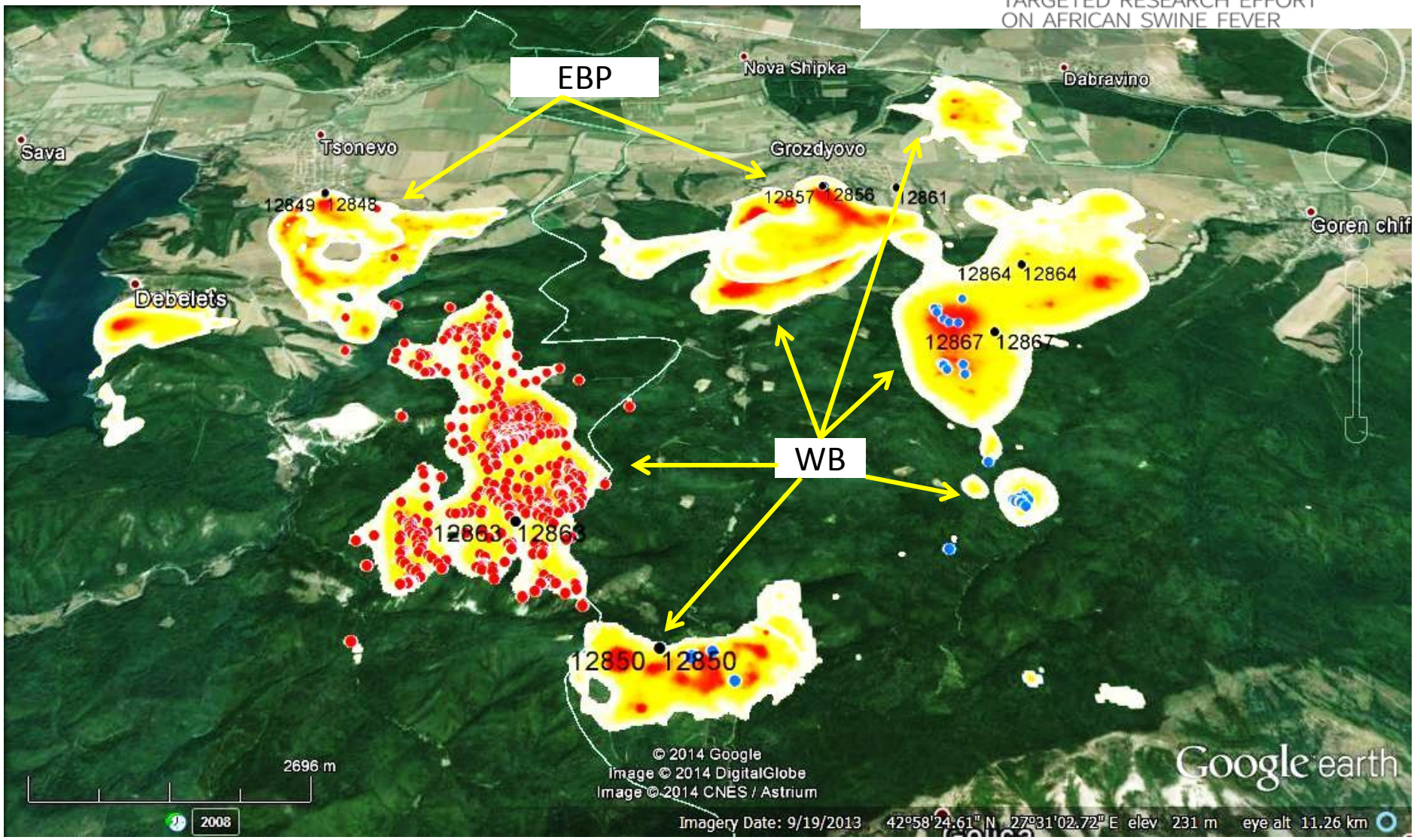
Telemetry study in wild boar and East-Balkan pigs in Bulgaria

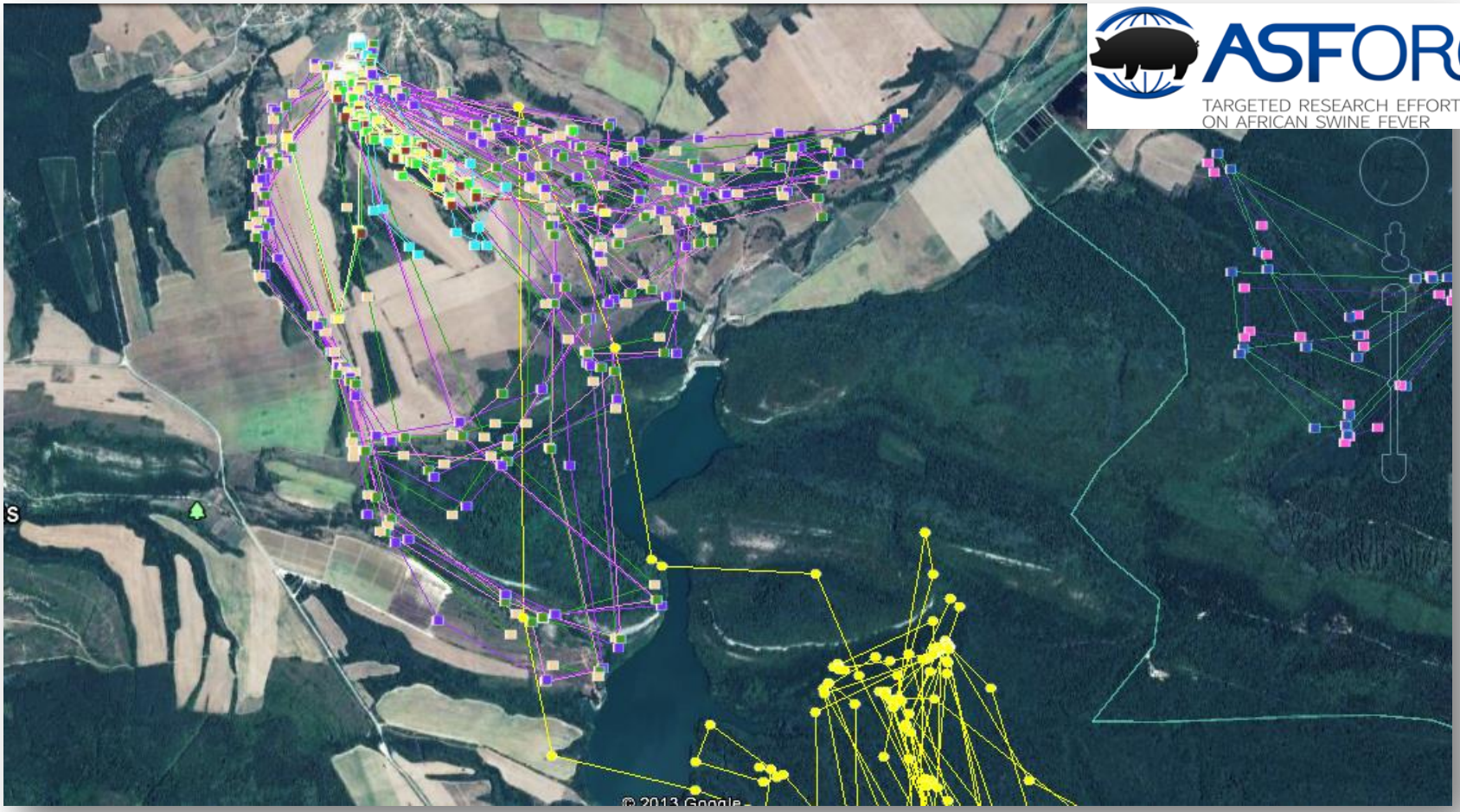
TARGETED RESEARCH EFFORT ON AFRICAN SWINE FEVER

Collars on 6 wild boar and 9 East-Balkan pigs

Location	ID	Species	Date_capture	IDCOL	Trap_num	Sex	Estim_Age_Months
Bulgaria	1	East-Balkan pig	6.3.14 10:05	12848	Tsonevo	female	36
Bulgaria	2	East-Balkan pig	6.3.14 10:00	12849	Tsonevo	female	48
Bulgaria	3	Wild boar	15.5.14 12:00	12850	2	female	48
Bulgaria	4	East-Balkan pig	6.3.14 10:30	12851	Tsonevo	female	48
Bulgaria	5	East-Balkan pig	7.3.14 12:00	12853	Tsonevo	female	36
Bulgaria	6	East-Balkan pig	6.3.14 10:10	12854	Tsonevo	female	48
Bulgaria	7	East-Balkan pig	6.3.14 9:00	12856	Grozdjovo	female	48
Bulgaria	8	East-Balkan pig	6.3.14 9:05	12857	Grozdyovo	female	36
Bulgaria	9	East-Balkan pig	6.3.14 10:20	12858	Tsonevo	female	48
Bulgaria	12	Wild_boar	23.4.14 18:00	12861	5	female	48
Bulgaria	14	Wild_boar	4.10.13 17:00	12863	6	male	40
Bulgaria	15	Wild_boar	18.2.14 15:00	12864	2	male	48
Bulgaria	16	Wild_boar	5.3.14 17:10	12865	2	male	36
Bulgaria	17	East-Balkan pig	6.3.14 10:50	12866	Tsonevo	female	36
Bulgaria	18	wild boar	7.3.14 13:00	12867	3	female	48

ASFORCE
TARGETED RESEARCH EFFORT
ON AFRICAN SWINE FEVER





Domestic pigs – wild boar interactions

Hybrid

How far can wild boar go?

ASFORCE
TARGETED RESEARCH EFFORT
ON AFRICAN SWINE FEVER

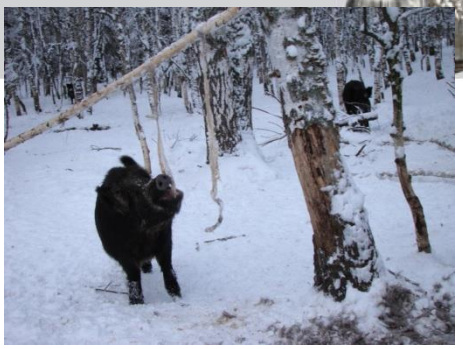
Thanks to all!

Options for non-invasive collection of saliva from wild ungulates for disease surveillance

Keith Sumption, Sergei Khomenko, Vesna Milicevic & Tsviatko Alexandrov

Practical Training of
Wildlife Surveillance,
Vitoshko-Studena, Bulgaria,
22-25 Feb 2016

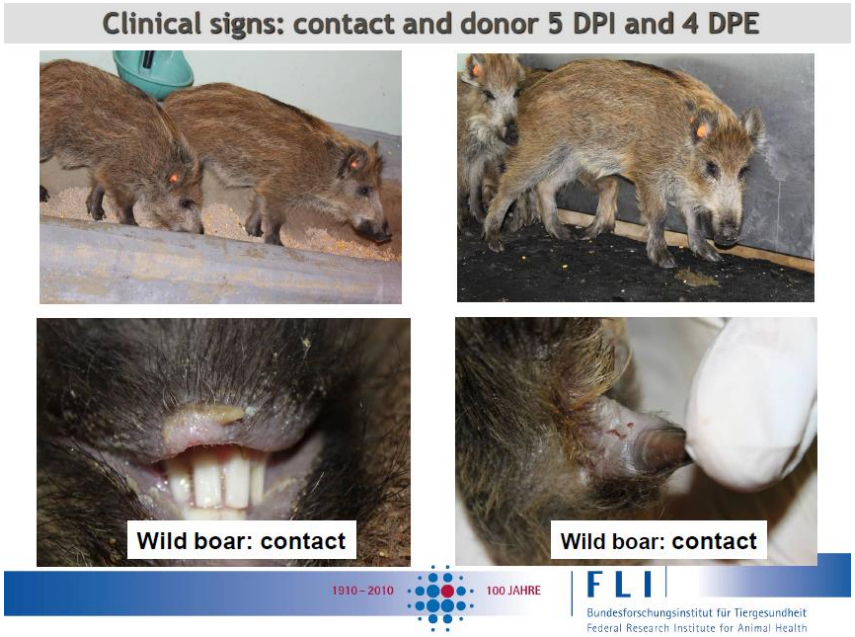
- Due to advances in diagnostic methods pathogens can be detected in oral fluids;
- Tested on farmed pigs (ropes) and wild boar (Chichikin et al, 2012);
- Saliva can be collected without catching or killing of animals (primate studies etc.).



Chichikin et al, 2012

1. Early pathogen detection rather than prevalence study;
2. Repeated frequent sampling possible;
3. Applicable where/when hunting is not possible/eligible;
4. Easy to incorporate into existing wildlife management practices;
5. Multi-species coverage (ruminants);
6. Cost effective and logistically simple.

Experimental infection



- Clinical signs on the 4 DPI (domestic 2 DPI) – e.g. incubation 4 days;
- Most severe and evident lesions – 7 DPI;
- Viraemia: 1 DPI through at least 9 DPI;
- NSP antibodies detected 7-8 DPI;
- RNA in saliva normally found up to 14 DPI and up to DPI 24 DPI intermittently.

CREDITS: A. Breithaupt, K. Depner, B. Haas, M. Beer (*FLI – Federal Research Institute for Animal Health Institute of Diagnostic Virology)*

A salt lick >

< < Wild boar feeding sites

A red deer feeding site

↓

Site attendance, species and population coverage

- Wild boar + red deer - 65 % attendance rate (7 feeding & 3 salt lick sites);
- Roe deer – 30 % attendance (3 salt licks);
- At attended sites most baits were taken;
- 15 % of wild boar and 15 % or red deer population (70 and 220 respectively) were sampled in 4 days (some even repeatedly).

Bait designs tested

1. Maize cobs with 6 swabs (5)

2. CSF vaccine bait with swabs inside (3)

3. CSF vaccine bait inside plastic tubes wrapped in cotton rope (1)

4. CSF vaccine bait wrapped in cotton material (2)

5-6. Swabs drilled into a block of salt

http://www.youtube.com/watch?v=oLkgePZfReg

Maize cobs taken by red deer and recovered

Bait performance

Saliva contaminated swabs

Bait types	Exposed, bait/nights	Bait uptake		Bait uptake by target species		Baits recovered with swabs	
		n	%	n	%	n	%
1. Maize cobs	125	62	**49.6**	56	**44.8**	47	**37.6**
2. Vaccine bait	77	52	**67.5**	25	**32.5**	16	**20.8**
3. Salt licks	8	1	**12.5**	1	**12.5**	1	**12.5**
Total	210	115	**55**	82	**39**	64	**31**

- More of the DNA positives are for wild boar (57.6%),
- 35.7% of the DNA tests for red deer are positive, 100% DNA recovery from salt licks,
- Salt licks work well for wild ruminants while vaccine baits and maize cobs for wild boar.

PCR tests of swabs in maize cobs, consumed by domestic pigs (Experiment performed in Nepal by Vesna Milicevic)

1	PAN 1	7 DAYS SICK, 5 PIGS, ALL ILL, AgELISA pos	POS
2		SALIVA FROM PIGLET WITH LESIONS, AgELISA pos	POS
3	PAN 2	5 DAYS OLD LESIONS, 1 SOW, 40°C	NEG
4	PAN 3	20 DAYS OLD LESIONS, NSP POSITIVE, 1 SOW	POS
5	PAN 4	5 DAYS OLD LESIONS, 7 PIGS	POS
6			POS
7	PAN 5	2 DAYS OLD LESIONS, 1 PIG, SWABS ROLLING ON THE FLOOR, AgELISA pos	POS
8	PAN 6	YOUNG SOW, NO SYMPTOMS	NEG
9	PAN 7	HEALTHY PIGS	NEG
10			NEG
11	SWAB BABY PIGLET	CSF CONFIRMED	POS

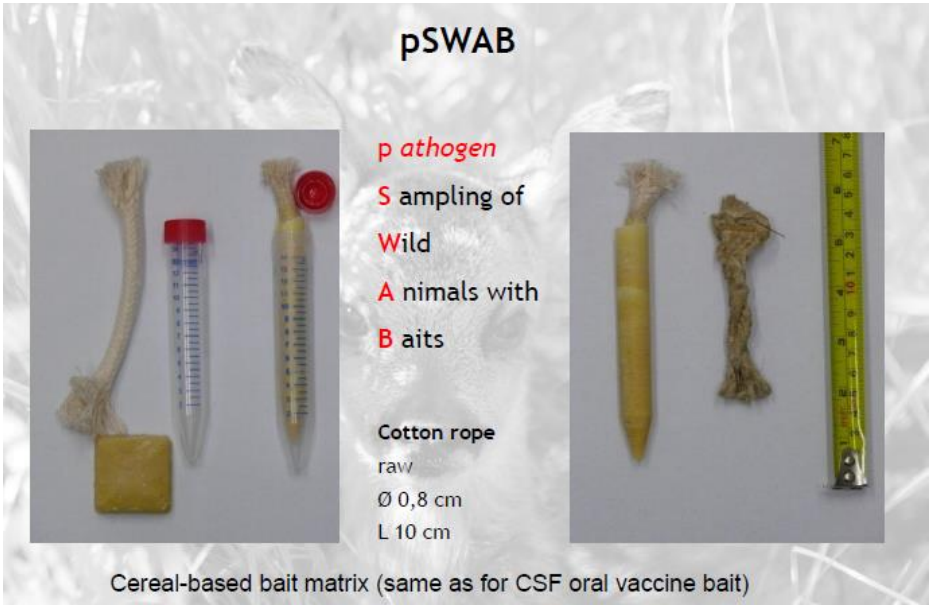
Attendance at feeding sites and salt licks documented for half a year (Mar – Aug)

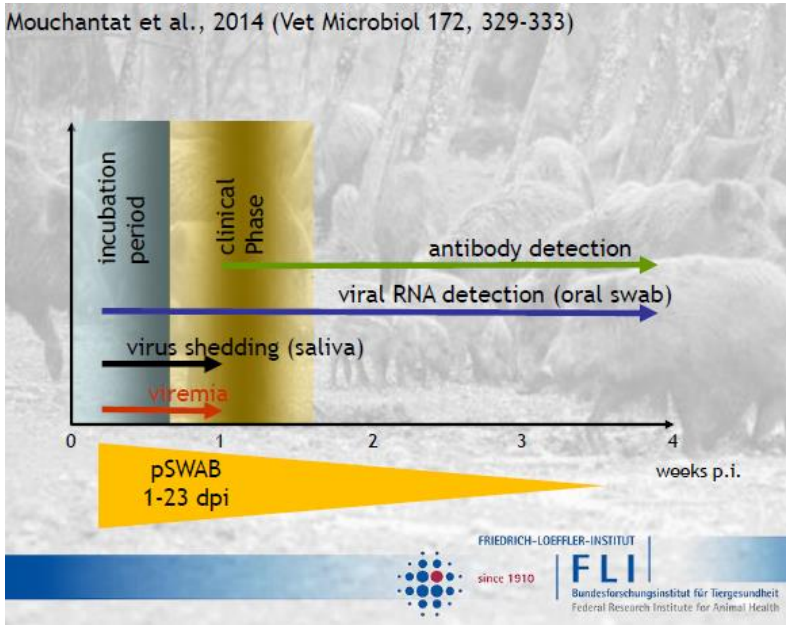

04/07/2013 20:12:02
10 Sec


04/01/2013 08:11:23
10 Sec

NI sampling: implications for disease management

- Provides a good solution for wildlife disease surveillance (no killing, inexpensive, easy to use, other diseases e.g. ASF, CSF);
- Early-warning or emergency surveillance in at risk areas in European wild ungulates can be improved and made more flexible;
- There is a potential for commercialization of specifically designed for surveillance baits or salt licks;
- Could be applicable to domestic animals too (extensive farming systems, small ruminants).





Non-invasive sampling for FMD – method optimisation

- ✓ Optimised tests or virus (PCR)
- ✓ Comparison of bait (pSWAB) and Q-Tips in maize cobs
- ✓ Comparable sensitivities
- ✓ Detection of FMDV days 1 to 9 (experimental infection pigs)
- ✓ Promising stability (for field use)

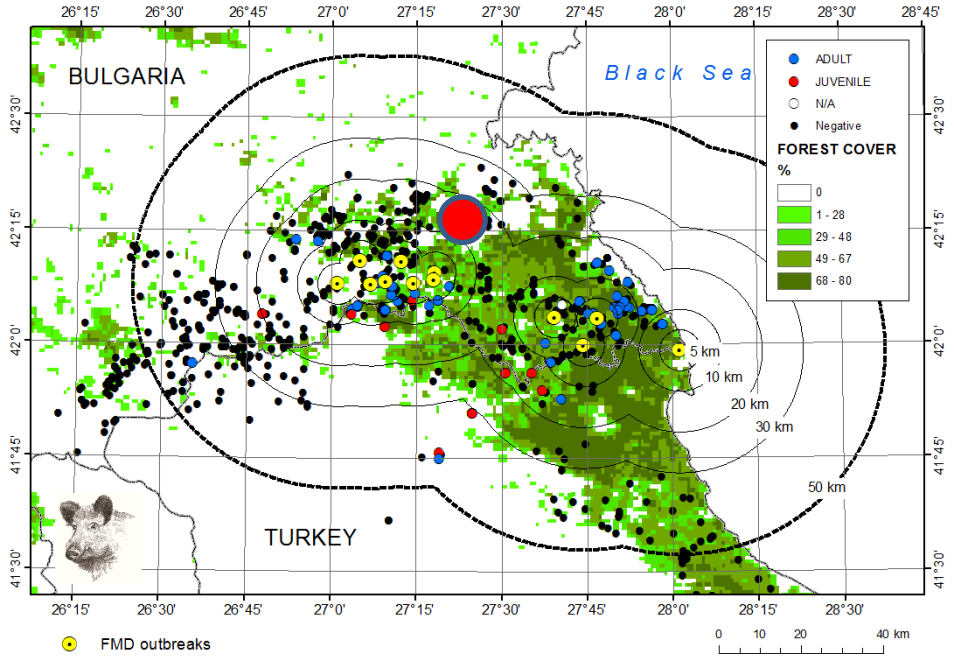
Studies commissioned by EuFMD at FLI, Insel Riems, 2014:

Putting it together: new options for surveillance and control of FMD epidemics in wildlife

Use risk based, non- invasive methods for DETECTING spread into wildlife

Risk based, where spill over or incursion expected

May require feeding wild boar – prelude to NI sampling in risk locations



Put this into Contingency Plans - use of feeding sites and non-invasive measures if infection detected

Consider:

- Integrated approach
- Use of feeding programmes to encourage bait use and avoid dispersion
- Use of feeding sites to accelerate natural process of infection and recovery (natural immunity, shorter duration epidemic)
- Risks
- Advantages- active use of options for non-invasive surveillance to monitor impact of controls

And some other species to be sampled?

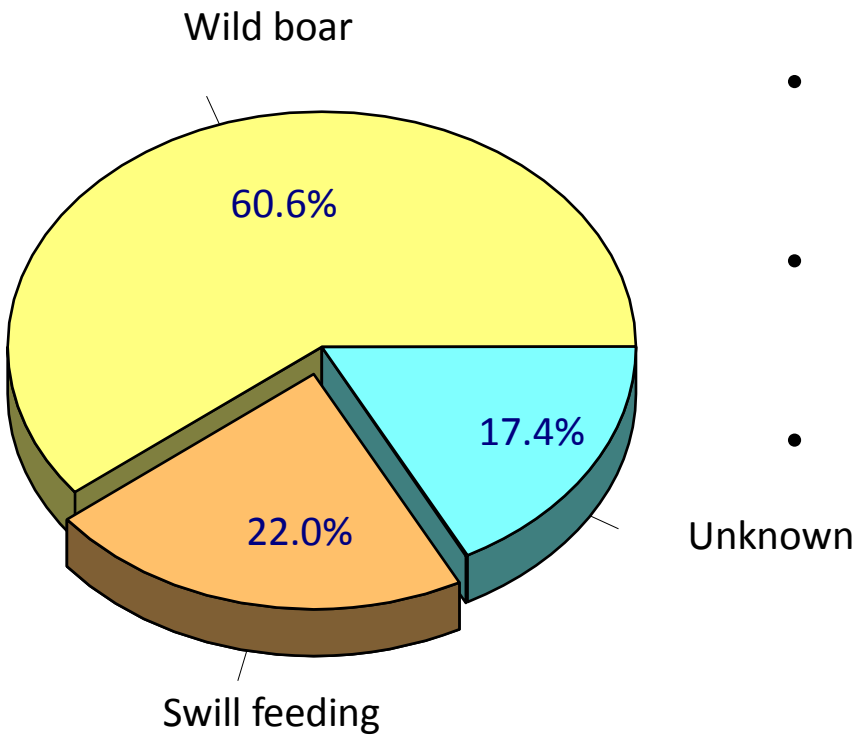
When CSF goes wild…

Surveillance/monitoring, control and eradication of CSF in wild boar – the EU approach

SViatko Alexandrov

Practical Training of Wildlife Surveillance, *Vitoshko-Studena, Bulgaria*, *22-25 Feb 2016*

CSF in Wild Boar



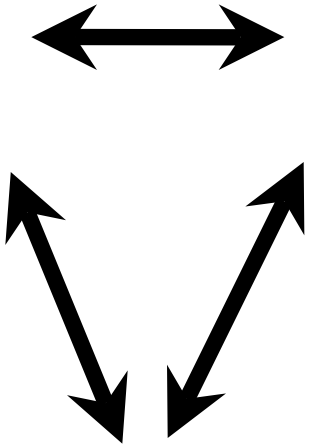
- Contagious disease of domestic pigs and wild boar
- Causes severe economical losses in domestic pigs
- Source of primary outbreaks (in Germany: 1993-2002, n = 109)

Epi role of wild boar

- Reservoir of CSFV
- Source of infection for domestic pigs
- Epidemiological links between domestic pigs and wild boar regularly reported.
- For the period 1993 - 1997 80% of 92 primary CSF outbreaks in domestic pigs in Germany were localized in areas enzootic for CSF in wild boar. In 60% of these cases direct and/or indirect contacts with wild boar and/or products thereof were reported (Teuffert et al., 1997; Fritzemeier et al., 2000; Laddomada, 1998).
- WB has a strong potential for transboundary spread of CSF

wildlife biology

- host density
- age structure
  (0-1y; 1-2y; >2y)
- movement activities
- reproductive rate
  (turn over)



disease biology

- pathogenicity
- incubation period
- morbidity
- mortality
- immunity *(active & maternal)*
- persistent infections

human activities

- *vaccination*
- *hunting*
- *feeding*

Factors influencing a CSF epidemic in wild boar

Main aims of controlling CSF in wild boar

- to reduce the risk of virus transmission to domestic pigs

- to prevent the “endemic phase evolution” or
-
- to reduce the endemic phase duration

- Prevent the disease to enter the domestic pig population

increased biosecurity, standstill, movement ban and surveillance in the domestic pig sector

- Prevent the disease to spread to other territories and wild boar populations

Control on wild boar density, hunting and harvesting

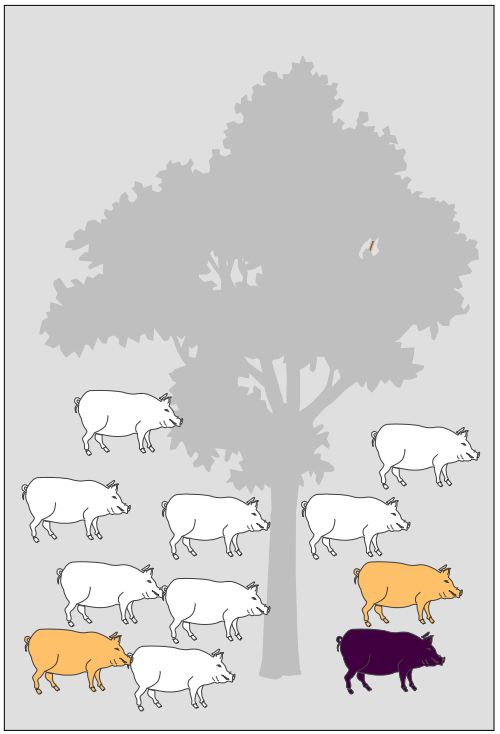
Infectious rate (R):

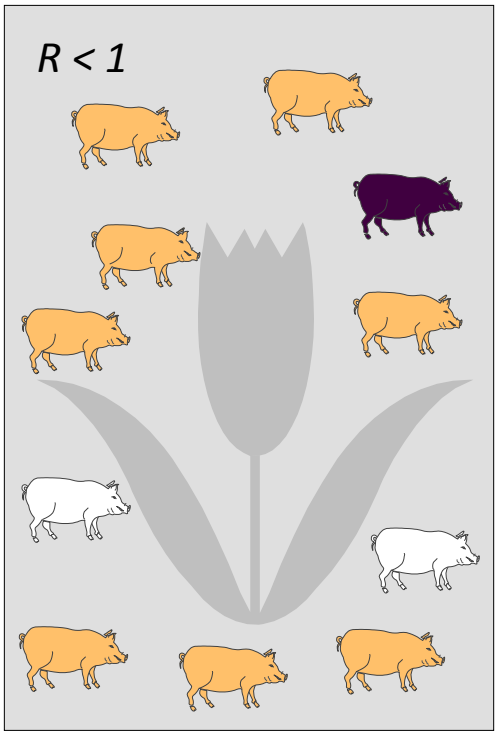
R > 1 = CSF is spreading
R < 1 = CSF dies out

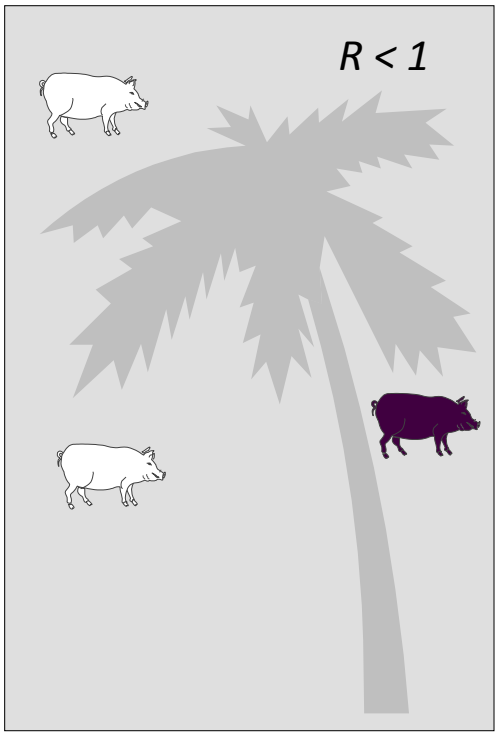
R > 1, if one animal infects more than one animal

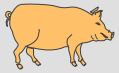
R > 1

Aim: ***Reaching a population density where R < 1***



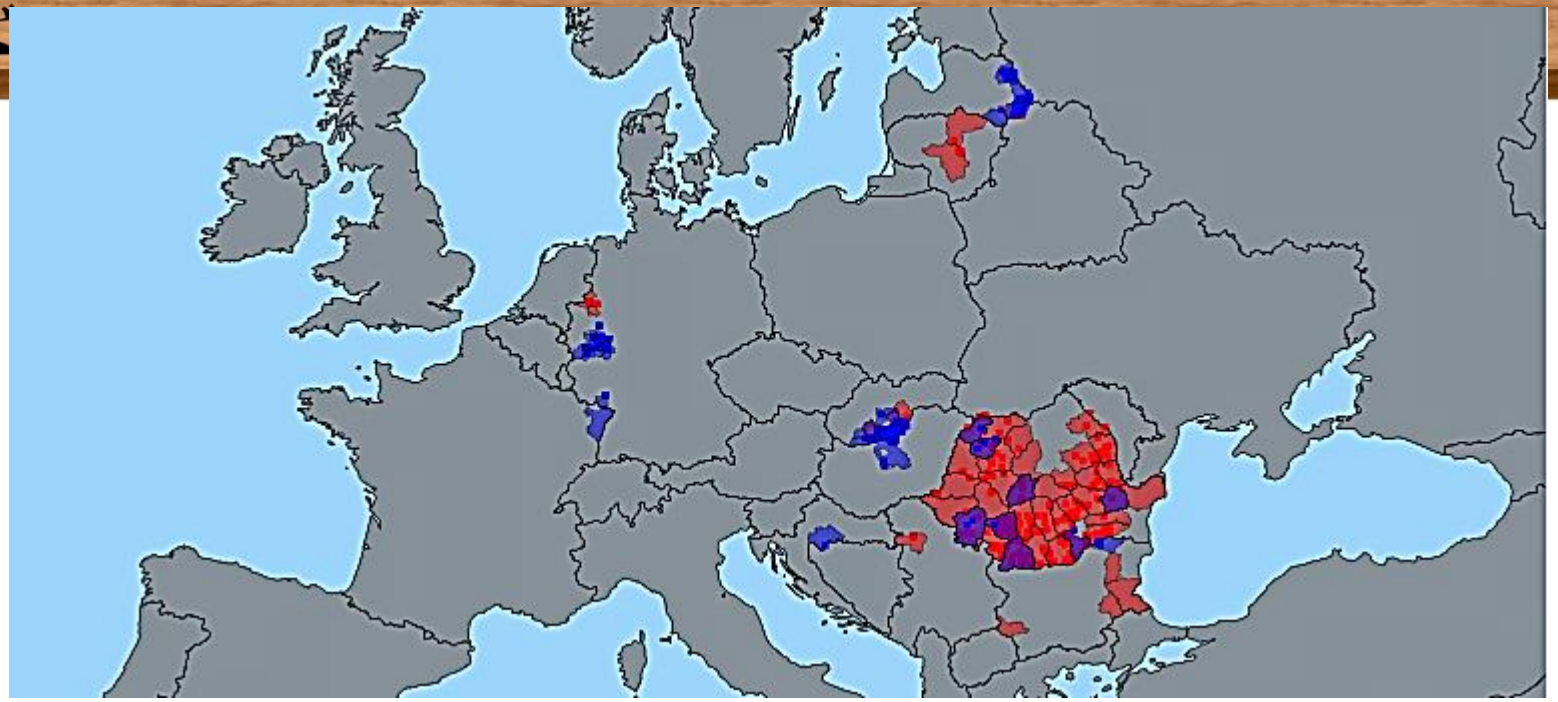




 immune

 not immune

 viraemic animal



ADNS map, CSF in **domestic pigs** and **wild boar**, 2005 - 2014

	CSF present in WB	Vaccination of WB against CSF
2005	Germany, France, Bulgaria, Romania	Germany, France, Bulgaria, Romania, Slovakia
2006	Germany, France, Romania, Macedonia	Germany, France, Bulgaria,
2007	Romania, Gremany, France, Croatia, Macedonia, Hungary	Bulgaria, Hungary, Slovakia, France, Germany
2008	Hungary, Slovakia, Croatia, Russia	Slovakia, Bulgaria
2009	Germany, Russia, Croatia, Hungary, Bulgaria	Germany, Bulgaria
2010	Russia, Hungary	Bulgaria
2012	Latvia	Bulgaria

Instructions available

- EU legislation, Council Directive 2001/89/EC
- the EFSA Scientific Opinion of the Panel on AHAW on the control and eradication of Classic Swine Fever in wild boar. The EFSA Journal (2009) 932 1-18.
- Guidelines on surveillance/monitoring, control and eradication of classical swine fever in wild boar European Commission, 2010 Document SANCO/7032/2010
- EFSA Scientific Opinion of the Panel on AHAW on African swine fever. The EFSA Journal 2010: 8(3): 1556.
- Guidelines on surveillance and control of African swine fever in feral pigs and preventive measures for pig holdings. SANCO/7138/2013 (Rev 4)

Scientific Opinion of the Panel on AHAW on the control and eradication of Classic Swine Fever in wild boar. The EFSA Journal (2009) 932 1-18.

- The aim of control measures in wild boar is to reduce the risk of transmission of CSFV to domestic pig, to prevent the “endemic phase evolution” or to reduce the endemic phase duration
- The main purpose of vaccination of wild boars is to limit the risk to transmit CSF virus to domestic pigs.
- The source of infection of CSF in wild boar is difficult to be determined. Therefore, the investigation and prevention of these outbreaks is very difficult to achieve
- The disease will fade out in small populations (between 1000 and 1500)
- The persistence of CSF depends on epidemiological and ecological factors such as the proportion of individuals that recover from infection, the occurrence of chronic infections, the social structure and dimension of the population. In particular CSF may persist several years among areas comprising more than 2000 shot wild boars.
- Wild boar cannot be managed as domestic pigs, i.e. using an exhaustive culling or vaccination strategy, because individual handling is impossible and because wild boar populations are highly dynamic (i.e. producing new susceptible animals). Alternatively hunting and vaccination can be used in order to stop transmission by reducing the number of susceptibles.

General provisions in cases of CSF suspicion or confirmation in wild boar

- Hunting, YES or NO;
- Ban for movements of pigs and products thereof;
- Ban on pig markets;
- Standstill;
- Raised awareness and bio-security;
- Expert group including veterinarians, hunters, wildlife experts and epidemiologists to assist the competent authority in studying the epidemiological situation, defining the infected area and to implement eradication plan;
- Hunting management and veterinary control have to be prepared to cooperate closely for mutual benefit;
- Oral vaccination of wild boar.

Hunting

Normal hunting (reaching 45% of the population) does not produce significant changes in virus persistence or spread;

A small increase in hunting rates (<60 %) can promote virus persistence and spread;

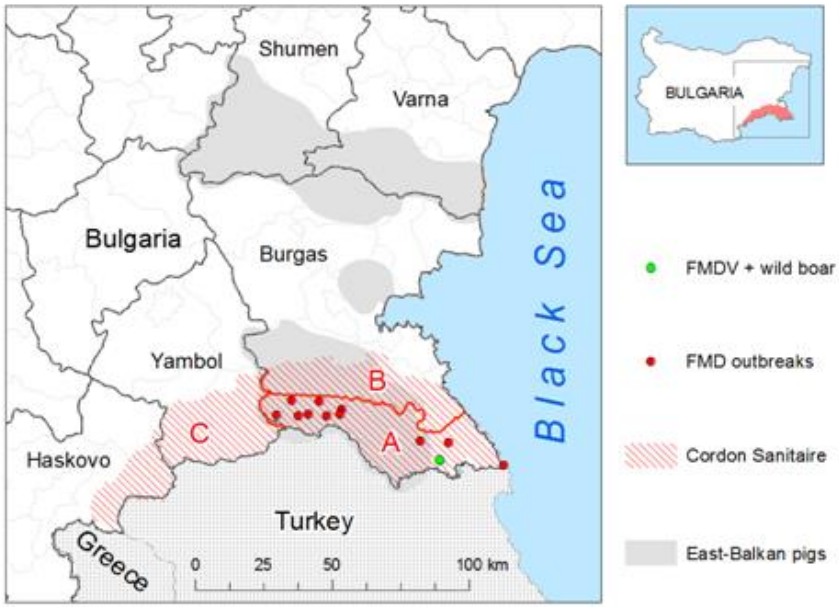
Very high, impractical hunting rates > 70-80 % would reduce virus spread significantly, but leads to local extinction of wild boar.

EFSA Scientific Opinion: *Control and eradication of CSF in wild boar*
The EFSA Journal (2009) 932, 1-18

General provisions in cases of CSF confirmation in wild boar

- **A written plan** submitted to the Commission within **90 days** of the confirmation of the primary case of the measures taken to eradicate the disease in the area defined as infected, which should also include the surveillance and prevention measures to be applied in that area and in the holdings of the same area.
- The plan should include the disease monitoring programme to be enforced after a period of at least 12 months has elapsed since the date of the last confirmed case.

How to plan the CSF surveillance and control program in wild boar?



Map. Example from the FMD incursion in Bulgaria in 2011 and the plan for the control of the disease in wildlife; A – infected area; B&C – risk areas;

- Identify the infected and potential risk areas
- Estimate the wild boar population in the infected and risk areas
- Identify all hunting grounds
- Identify all domestic pig holdings , pigs, animal markets etc.

Surveillance and control in wild boar

- Passive surveillance – mortality in wild boar, testing carcasses for CSFV
- Active surveillance: serological and virological monitoring

- Target 59 heads per area with estimated wild boar population between 200 and 2000 heads to detect 5% prevalence with 95% confidence.
- The sampling of the wild boar population in each of the zones is planned according to the guidelines in Chapter IV, of Annex to Commission Decision 2002/106/EC i.e. 50% of the tested wild boar should be up to 1 year of age, 35% between 1 and 2 years old and 15% over 2 years.

What do we need to know?

- Location/Geographical coordinates of the wild boar shot/found dead
- Age of the wild boar;
  - juveniles < 1 year
  - 1-2 years old
  - > 2 years old
- Sex;
- Any change in health status before death and lesions found during necropsy;
- All hunters involved;
- Traceability of meat and all products;
- Vaccination: Yes, No

Does age matter?

EU Reference Laboratory

CLASSICAL SWINE FEVER IN WILD BOAR SURVEILLANCE DATABASE

Home | Query data | Maps | Service | Help

» CSF-DB » Home » Start page

logged in as: **tsv.alexandrov@nvms.government.bg** | Logout

Welcome to the Classical Swine Fever in Wild Boar surveillance database



2014-10-22

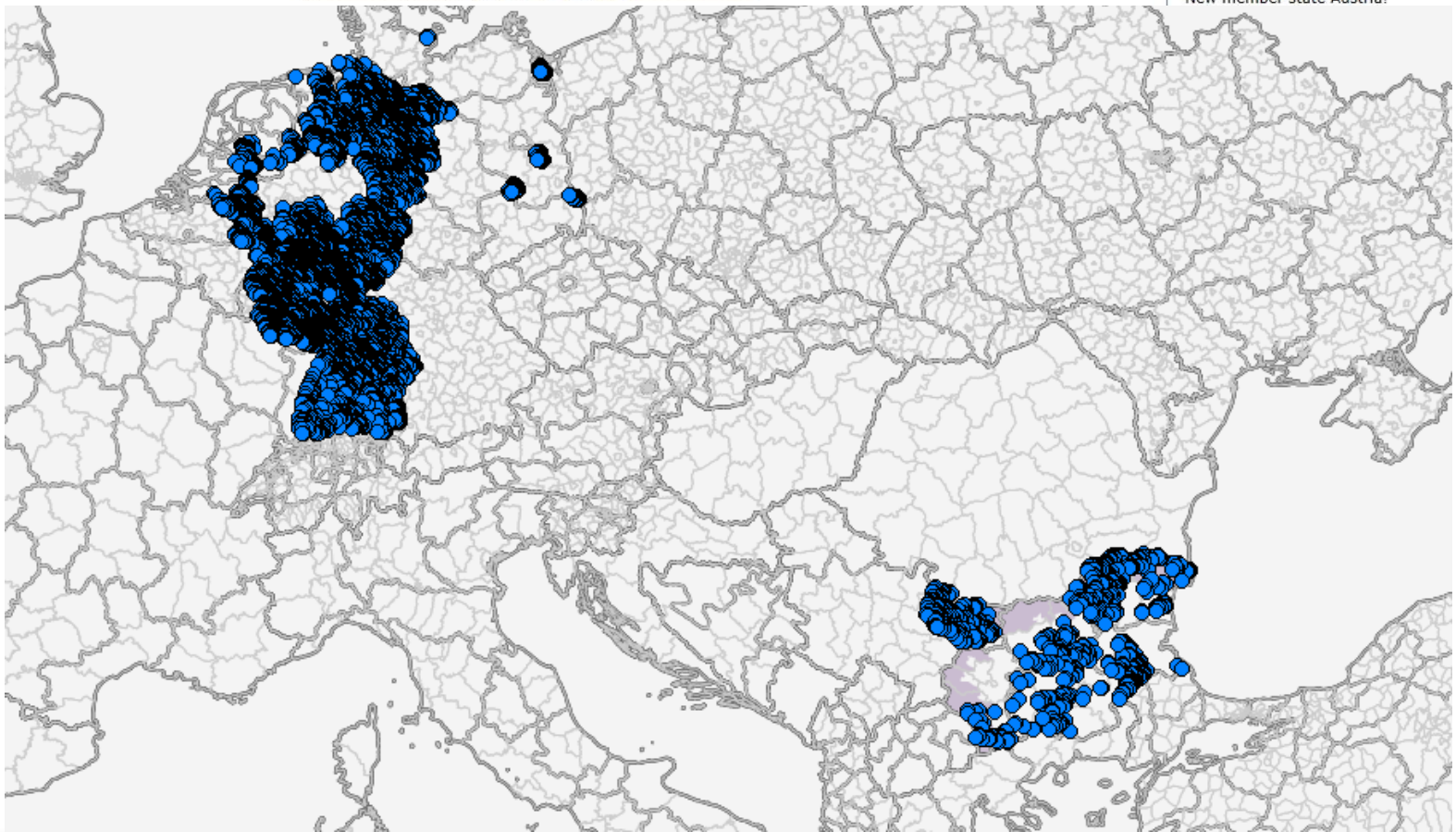
CSF-wildboar.eu Release 2.1.0 online

2014-08-20

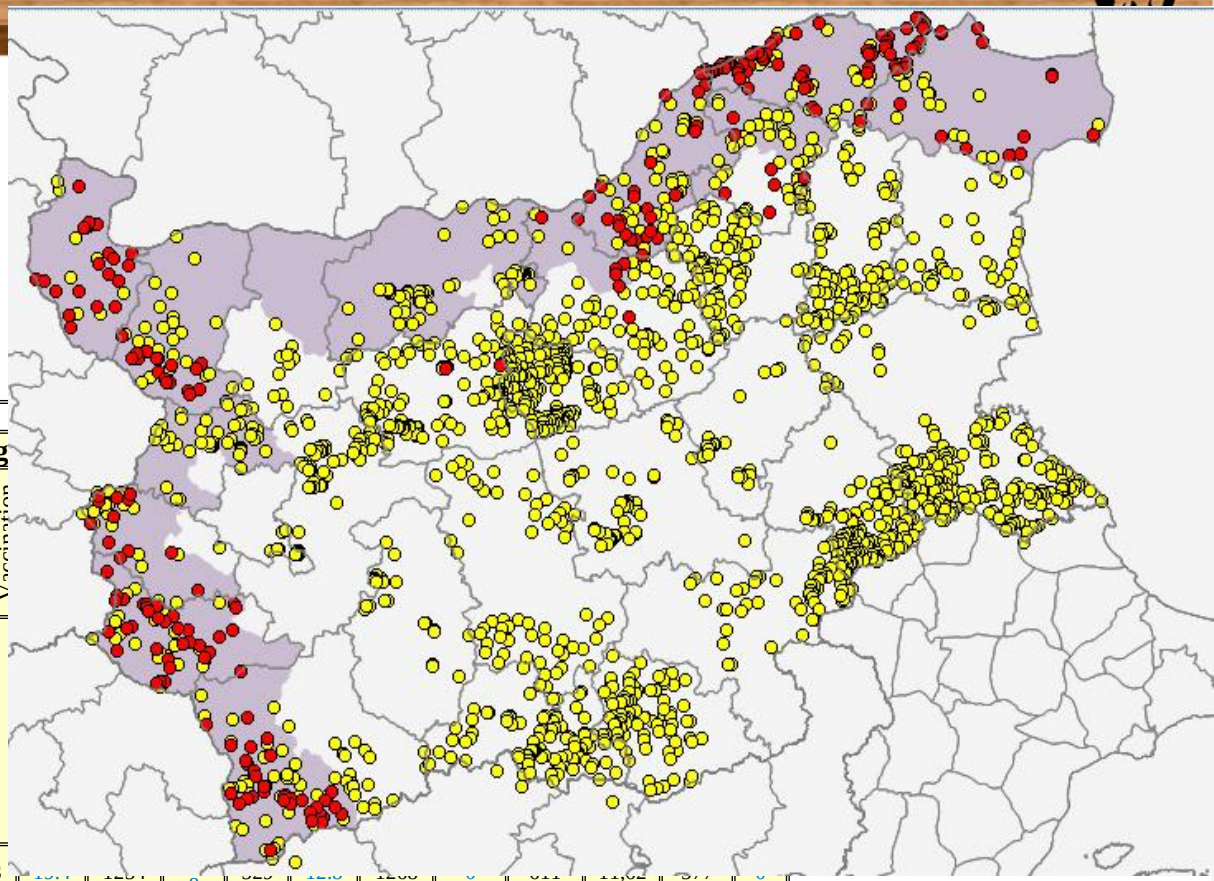
NEWSLETTER | development - new name - official records - new member

2014-08-15

New member state Austria!



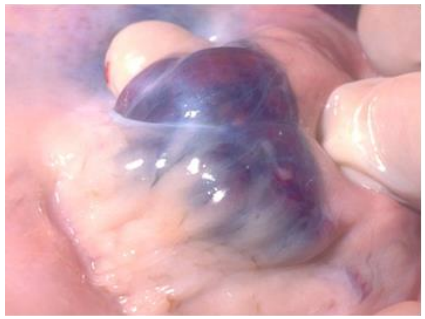
The CSF EU database

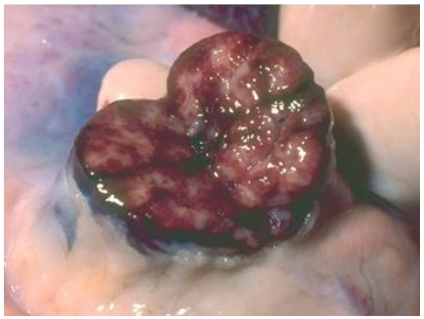


year	2010				2011													
Serolog																		
Age of wild boar in months	Vaccination area		Non-vaccination area		Vaccination area		Non-vaccination area		Vaccination									
	Serologically tested	% seropositive*	Serologically tested	% seropositive*	Serologically tested	% seropositive*	Serologically tested	% seropositive*	Serologically tested									
0 - 12	527	19.9	1567	0.2	331	16	1186	0.08	603									
12 - 24	437	34.6	1182	0.2	401	41	867	0.1	568	37.3	1081	1.1	364	41.8	922	0	578	50,74	532	0
> 24	346	23.4	1144	0.3	418	43	1507	0.53	611	54.3	1805	0.6	402	53.5	1537	0	627	63,31	904	0
Total № of WB tested	**1310**		**3893**		**1156**		**3560**		**1782**		**4140**		**1295**		**3727**		**1816**		**2013**	
	5203				**4716**				**5922**				**5022**				**3829**			
Virological surveillance **																		
Total № of WB tested	**5020**				**5759**				**6315**				**5243**				**6506**			

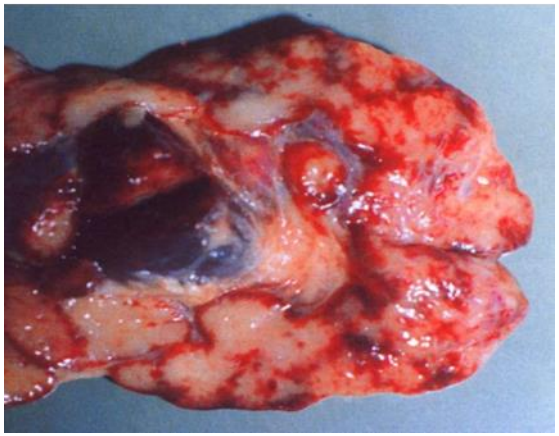
Can we distinguish CSF from ASF in WB?

ASF

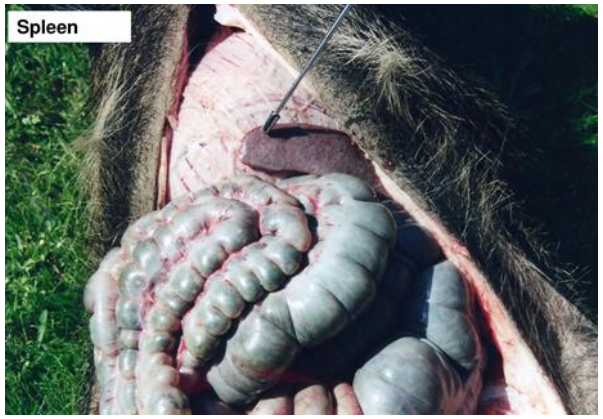




CSF



NB! Always laboratory diagnosis is needed!

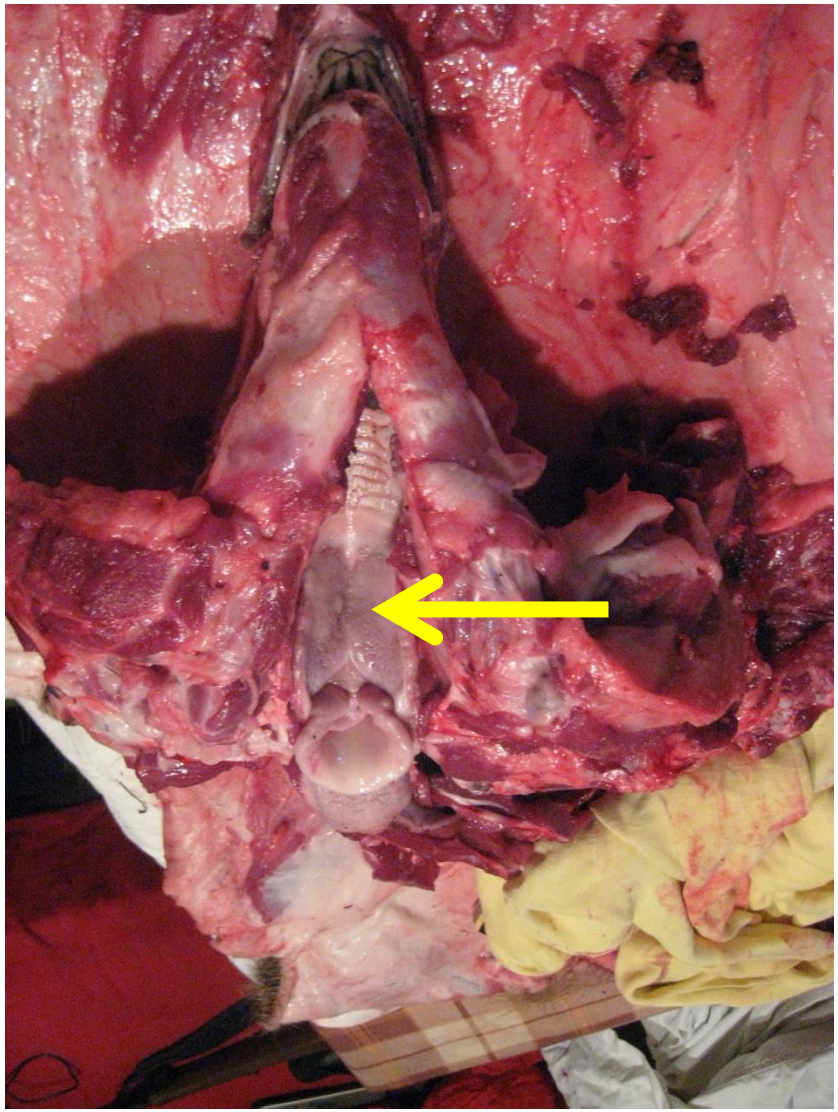


What samples to take from wild boar?

- Blood
- Tonsils
- Kidney
- Spleen
- Lymph nodes (mesenterial)

Sampling by veterinarian or trained for the purpose hunter/operator

Sampling and biosecurity?



Hunters and biosecurity?

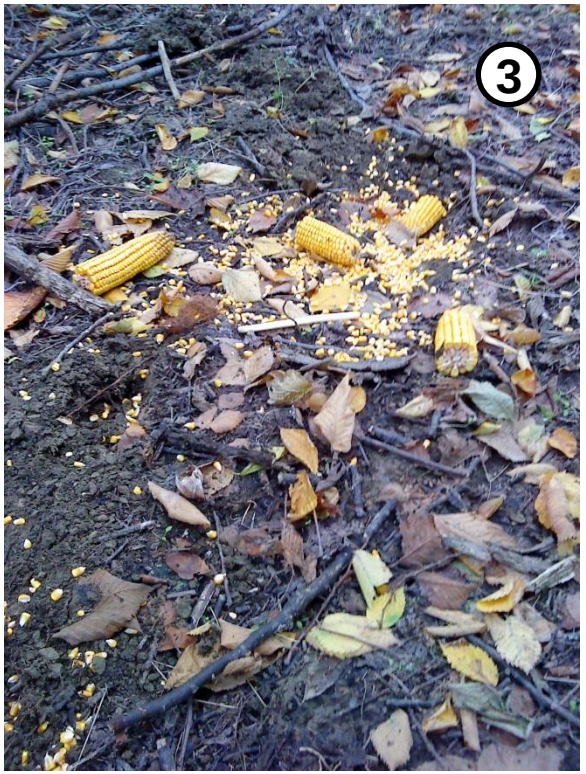
Game collection centers

- Keeping of wild boar carcasses in collection centers till laboratory results available
- Sampling in the game collection center
- Disposal of all ABP

Population control issues

- Wild boar extermination is impossible to achieve in principle;
- Population control has proved to be inefficient in managing diseases (e.g. CSF; see EFSA, 2009);
- Preventive (not emergency !) population control can work out …
- …if is based on wise management practices;
- Where present CSF can reduce population better than hunters….

Oral vaccination of wild boar



Thoughts and conclusions

- There is a lot more going on in the wild boar population than what is observed……
- Attempts to decimate WB boar from an area should not be carried out in a way the survivors spread the disease.
- In infected areas, vaccination, trapping and procedures to remove WB carcasses are appropriate.
- CSF evolution and maintenance depends on wild boar density

Dr Tsviatko Alexandrov - Animal/Wildlife health officer, Bulgarian Food Safety Agency,
tel.: 00359 882 469 345; e-mail: t_alexandrov@bfsa.bg & tsv.alexandrov@yahoo.com

Trapping as an alternative method to eradicate FMD/CSF/ASF in wild boar

Dimitar Stefanov &
Tsviatko Alexandrov

Practical Training of
Wildlife Surveillance,
Vitoshko-Studena, Bulgaria,
22-25 Feb 2016

CSF in wild boar in Bulgaria
Case report

2009

2009

8 positive CSF cases in wild boar

INFECTED AREA
25 sq km

Тутракан Tutrakan

Tutrakan

1. 08.09/ found dead/ 3-4 months/ PCR +/ Ab neg.
2. 26.09/ shot/ 5 months/ PCR +/ Ab neg.
3. 26.09/ shot/ 5 months/ PCR +/ Ab +
4. 28.09/ shot/ 5 months/ PCR +
5. 14.10/ trapped/ 6 months/ PCR +/ Ab +
6. 02.11/ trapped/ 4 months/ PCR +/ Ab +
7. 27.11/trapped/ 4 months/ PCR +/ Ab +
8. 27.11/trapped/ 4 months/ PCR +/ Ab +

All positive animals younger than 6 months!!

Image
Google
Eye alt 40114 ft

Origin of CSF virus ?

- **CSF virus was there undetected over years?**
  - During hunting season 2008/2009 – 84 wild boars were tested in the infected area: all negative;
  - No outbreaks or suspicion of CSF in domestic pigs in that area;

- **Introduced by migrating and infected wild boar from outside the area?**
  - No evidence of CSF in other parts of Bulgaria and Romania

- **Introduced by humans *(catering waste, others*)?**
  - Illegal landfill nearby the infected area;
  - No outbreaks or suspicion of CSF in domestic pigs in that area;

Genotype of the virus: 2.3 (CRL in Hannover)

Similar to older isolates from: BG, DE, SK, HU, RO…but NOT identical with the CSF virus found in Romania in January 2009

Control strategy

- **Increasing surveillance in domestic pigs and wild boar;**
  - clinical examination of all pig holdings
  - serological investigations of domestic pigs in back yard holdings!!!
  - sampling of every trapped, shot or found dead wild boar

- **Decreasing the wild boar population**
  - **By trapping (not hunting) in the hot spot area**

- **Vaccination**
  - Vaccination on islands in the Danube
  - Vaccination in the surrounding of the hot spot area
  - Vaccination in the hot spot area after intensive trapping

Trapping in the infected area
(period 28.08.2009 – 31.01.2010)

Estimated WB in the infected area: 156
(~ 6 animals/km²)

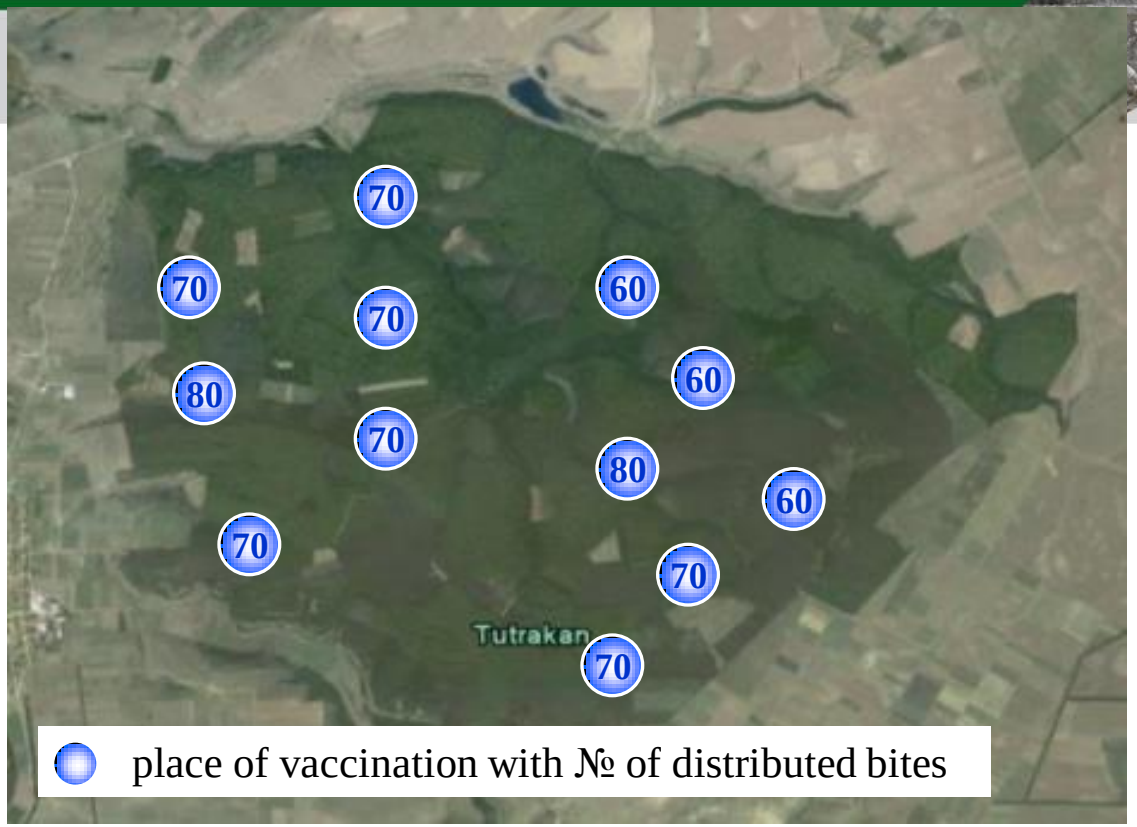
Trapped wild boar			
0-6 m	**6-12 m**	**12-24 m**	**> 24 m**
24 *(20%)*	70 *(59%)*	17 *(14%)*	8 *(7%)*

- 119 wild boar trapped ***(~76%)***
- Wild boar population decreased below 2 animals/km²
- About 37 wild boar left, no offspring

Last CSF case: 27.11.2009;
No CSF case since then;

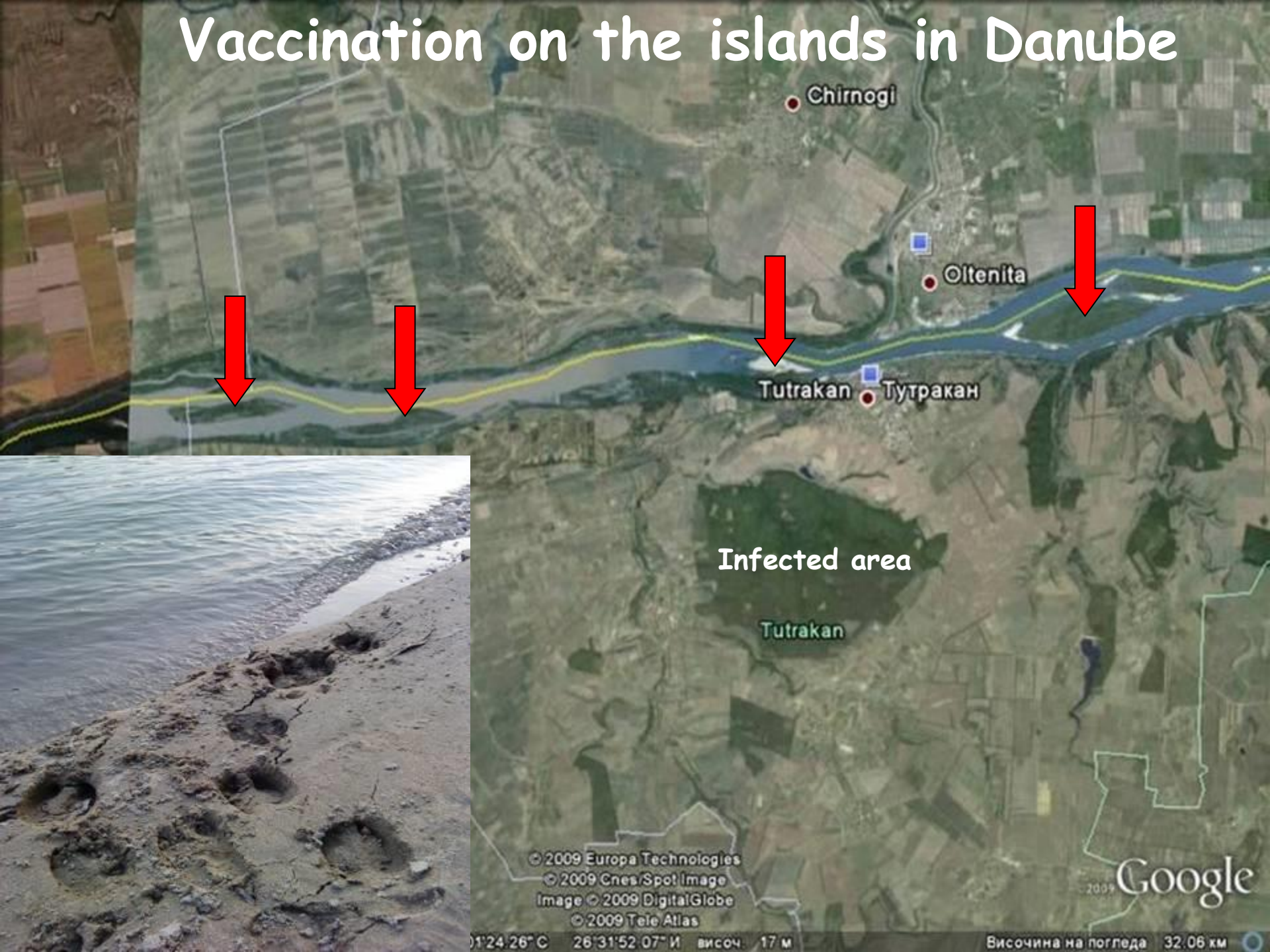

29.10.2009

Vaccination in the hot spot



Vaccination campaigns 2009	№ of places	№ of distributed bites	
I (Feb- March)	8	350	
II (June)	8	340	
III (30Nov-15Dec)	12	830	
Total		1520	

Vaccination on the islands in Danube



Thanks to all!

Non-invasive sampling systems for the detecion of FMDV in wild boar

Susan Mouchantat*, B. Haas, A. Globig, W. Böhle, K. Depner

*Junior Research Group Wildlife Diseases
Friedrich-Loeffler-Institut
Greifswald - Insel Riems
Germany

Background

Transboundary animal diseases – role of wild boar

- FMD incursion to Bulgaria (2011)
- CSF outbreaks in Latvia and Lithuania and other European countries (2011-2013)
- ASF epidemic in the Caucasus, Russian Federation, Lithuania, Latvia and Poland (2007-2014) – still ongoing
- remarkable increase of wild boar populations in Europe

Current sampling approaches

- Wildlife surveillance mostly linked to hunting or trapping
- Sampling rather irregular
- Hunting seasonally limited
- Rarely adequate number of samples collected
- Mostly serological tests performed – only retrospective analysis

pSWAB

p *athogen*

S ampling of

Wild

A nimals with

B aits

Cotton rope

raw

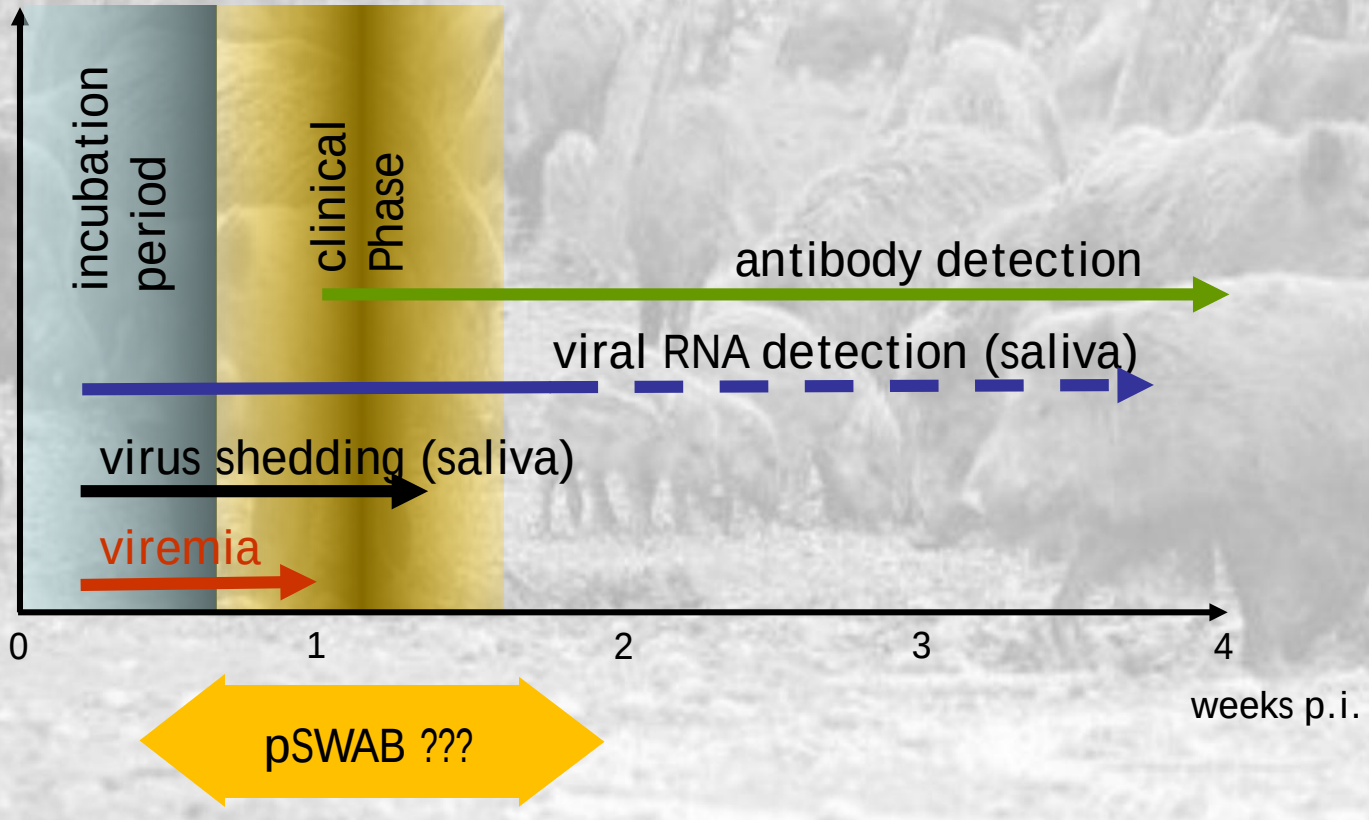
Ø 0,8 cm

L 10 cm

Cereal-based bait matrix (same as for CSF oral vaccine bait)

Animal Trials in Wild Boar

Mohamed et al., 2011; Breithaupt et al., 2012



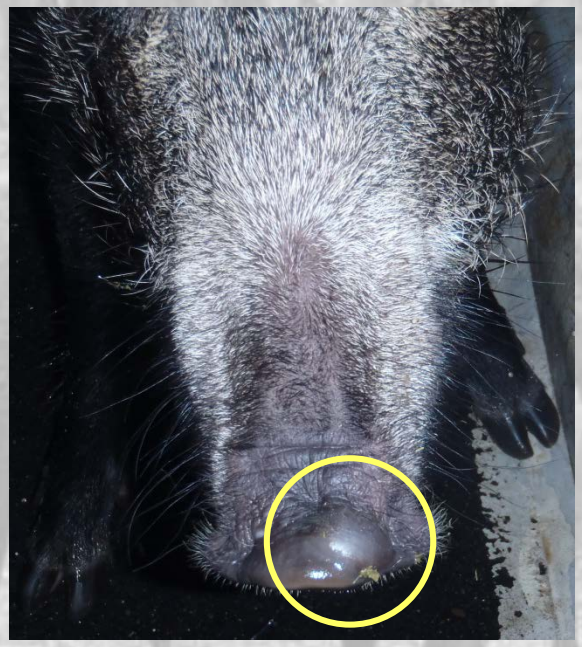
FLI Animal Trial - FMD Wild Boar

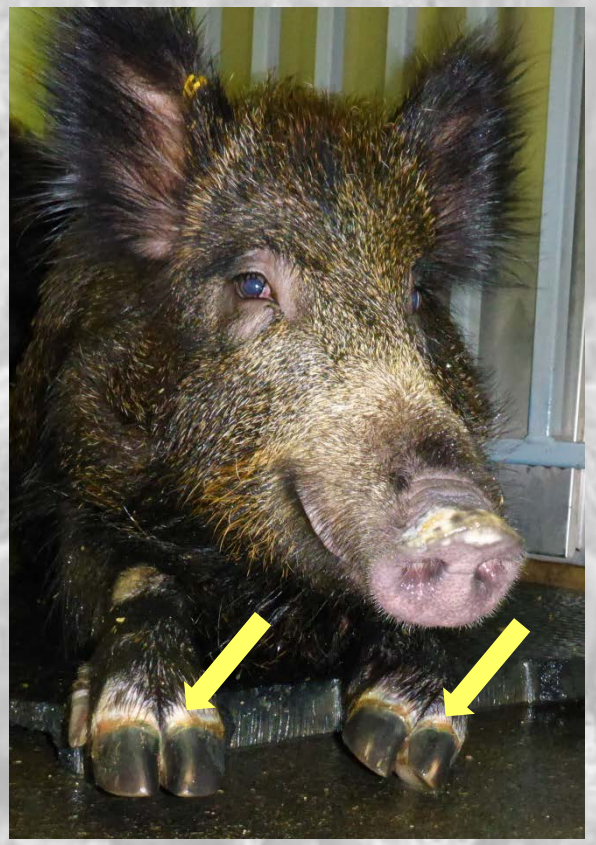
Mouchantat et al., 2014 (Vet Microbiol 172, 329-333)

Animals	5 wild boar (10 months, 65-75 kg)
Inoculation	s.c. (bulb of the heel) of 2 donor pigs
	$10^{6,8}$ $TCID_{50}$ FMDV O/BUL/1/2010
Sedation	**Tiletamin/Zolazepam (Zoletil® 100) 2,2 mg/kg**
Euthanized	29 d.p.i.
pSWABs	distribution every day
(n=5)	collection same or next day
Blood samples/oral swabs	
	2(1)x per week under sedation
Nucleic acid	RTqPCR (3D (OIE-Protocol) + IRES)
Serology	PrioCHECK FMDV Type O

Animal trial – FMD I

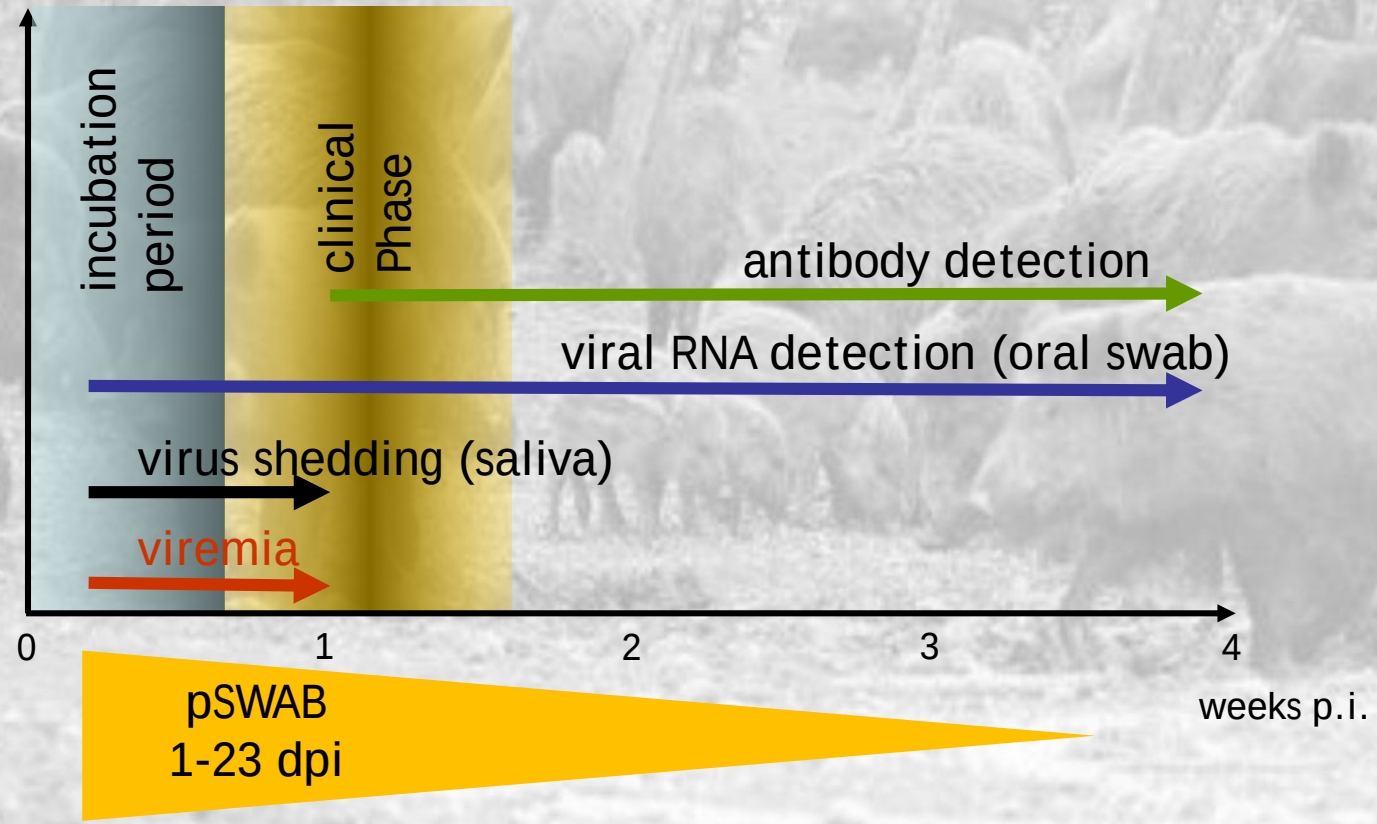
2/4 dpi





Animal trial – FMD I

Mouchantat et al., 2014 (Vet Microbiol 172, 329-333)



Animal trial – FMD I

Conclusion

FMD: all animals infected (contact animals 2 d later)
incubation period 2 d
severe and evident lesions 5-7 dpi
all animals recovered

pSWAB: feasibility for the detection of FMDV infection in wild boar
comparable sensitivity (conventional saliva swabs)

3 holes on each side of the maize ear, in total 6, for 3 Q-tips cut in half

FLI Animal Trial - FMD Domestic Pig

Animals 5 pigs (2 months, ≈ 20 kg)

Inoculation s.c. (bulb of the heel) of 2 donor pigs
$10^{6,5}$ $TCID_{50}$ FMDV O/BUL/1/2010

Euthanized 2x 2 d.p.i.; 2 x 7 d.p.i; 1x 10 d.p.i

pSWABs +
Maize ears distribution every day, collection on same day

Oral swabs (Salivetten) taken 7 times

Nucleic acid RTqPCR (3D, OIE-Protocol)
Serology no antibody found

FLI Animal Trial - FMD Domestic Pig

d.p.i.	Q-Tip Pools				
1	32,96	35,59	31,75	31,66	33,19
2	21,09	21,76	19,72	19,33	19,77
3	31,71	28,99	30,42	29,74	30,12
4	27,75	29,37	25,79		
5	20,20	23,65	31,91		
6	27,21	25,29	27,00	no ct	
7	26,82				
8	33,64				
9	34,70	30,20	no ct		
10	no ct				

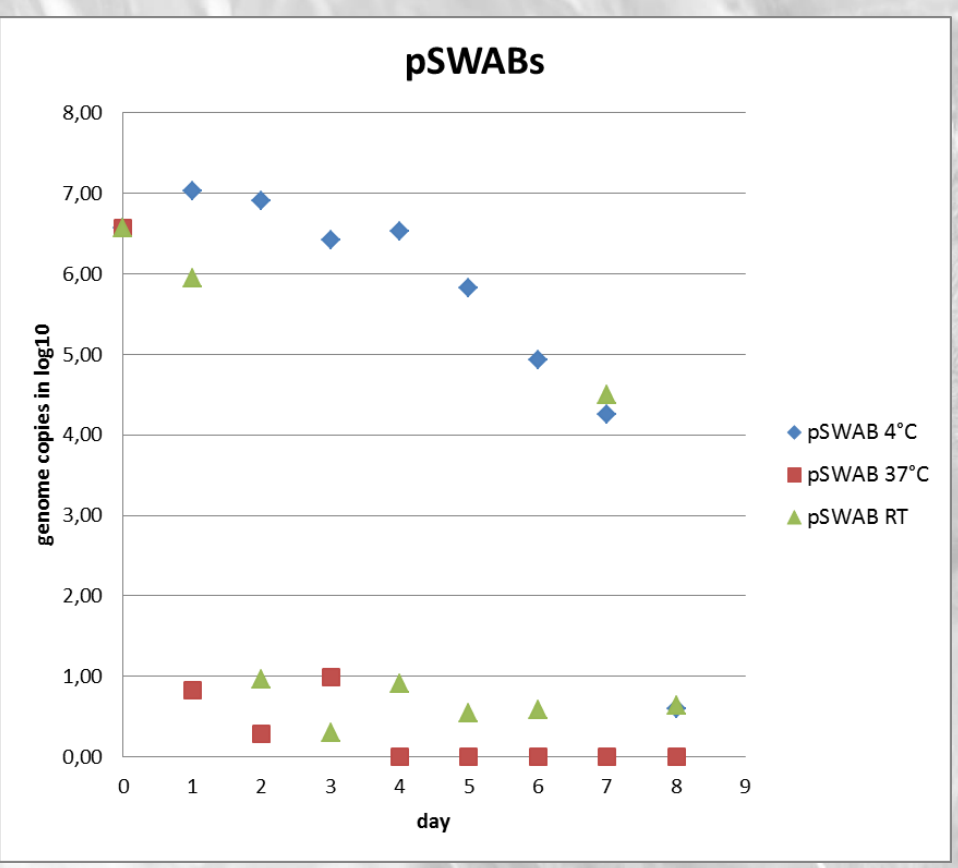
d.p.i.	pSWABs				
1	27,76	28,43	28,00	30,67	28,63
2	21,80	22,38	24,73	22,59	25,09
3	30,12	30,60	29,41	30,38	26,49
4	31,56	26,95	26,96		
5	27,56	26,13	26,95		
6	33,03	27,16	26,16		
7	26,84	26,51	26,86		
8	33,26				
9	35,28				
10	38,48				

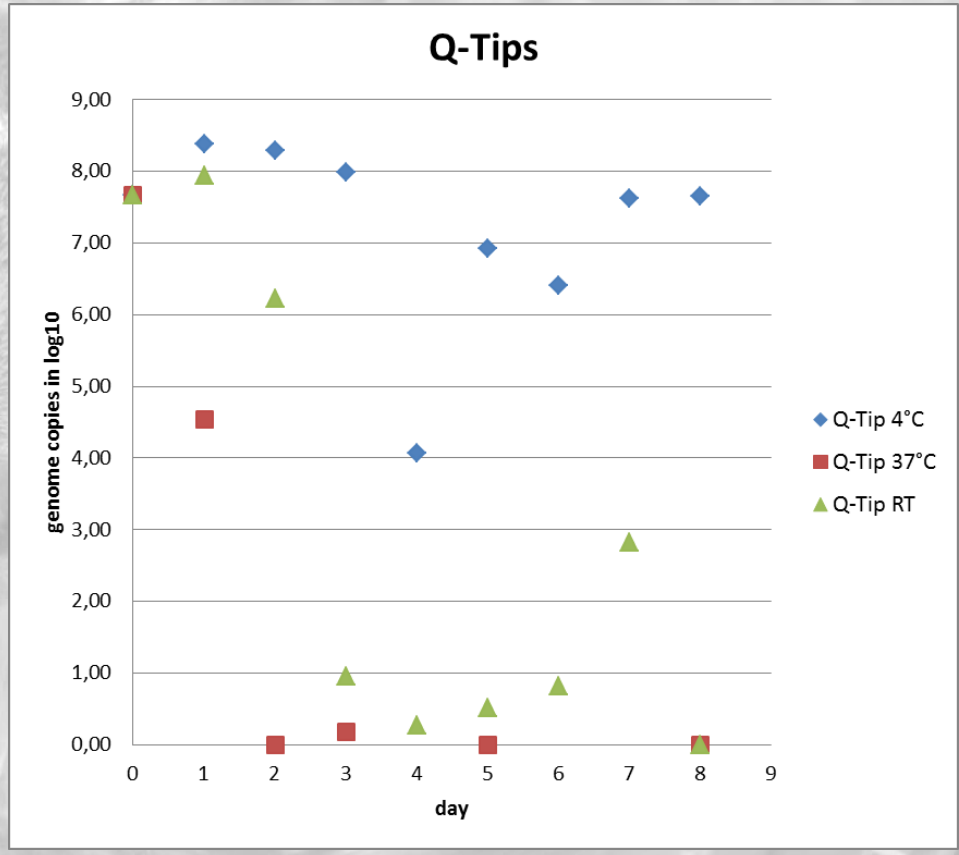
Ct values

< 20	30 - 42
> 20-30	no ct

FLI Animal Trial - FMD Domestic Pig

Stability trials: 8 day, 3 temperatures





Non-invasive sampling

Advantages : pSWAB

- Collective sample
- Early pathogen detection
- Repeated frequent sampling possible
- Applicable where/when hunting is not possible
- Easy to incorporate into existing wildlife management practices
- Cost effective and logistically simple

Field trial

Distribution at different feeding points in Germany

in progress

⇒ Acceptance?

⇒ Quantity?

⇒ Collection?

⇒ Quality?

⇒ Influence on testing?

⇒ Diversion of pSWABs?

Open Issues

- Evaluation of the practical use in the field
- Distribution and collection of the sampling baits
- Field studies in FMD/CSF endemic regions
- Use of pSWABs for other investigations (serology, genetics…)
- Evaluation of multiplex PCR for viral genome detection and quantification of chewing

Acknowledgement

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Thank you for your attention

"*Saliva is not one of the popular bodily fluids. It lacks the drama of blood, the sincerity of sweat and the emotional appeal of tears*." Irwin D. Mandel (1990)

Marzipan for pigs

When FMD goes wild…

Developing strategy and building capacity to holistically address animal health issues at the wildlife-livestock-human interface in Eastern and Central Europe

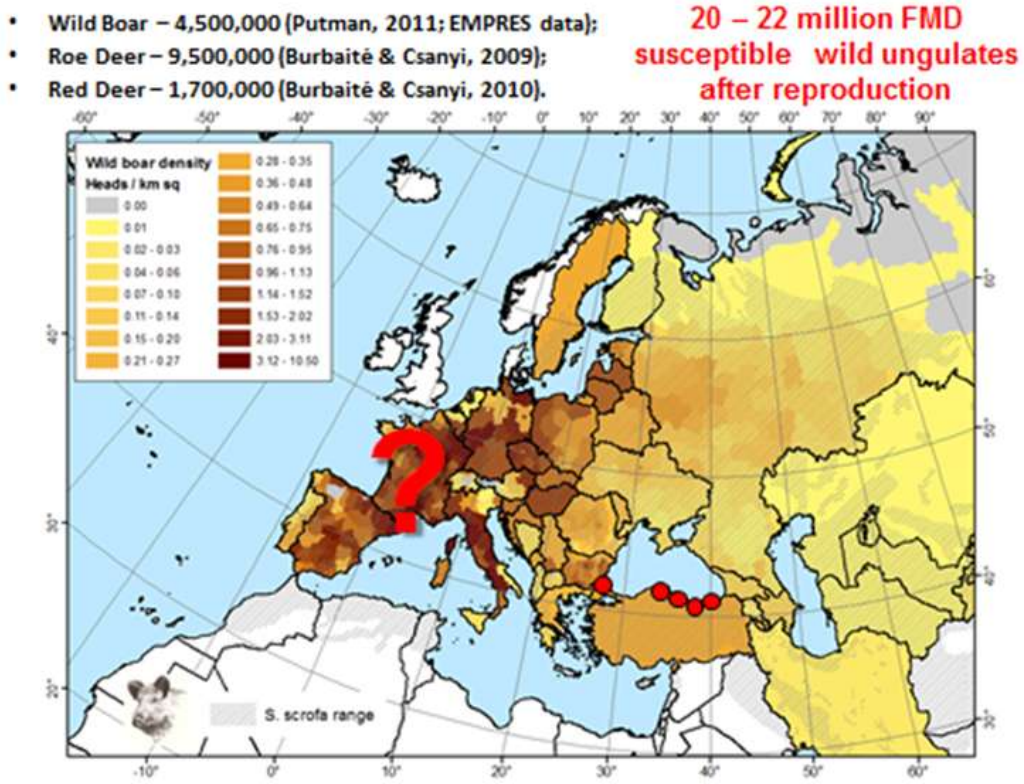
Bernd, Lindsey, Alessia, Tsviatko

Special Committee on
Research & Programme Development
Frascati, Italy
12-14 Nov 2013

Background

- remarkable increase in Europe of wild boar, as well as other wild ungulate populations
- significantly increased epidemiological role (particularly that of wild boar), as actual (e.g. CSF, *trichinellosis*) or potential (e.g. ASF, FMD) host species for a range of important livestock and human pathogens

- threat for re-emergence, spread and maintenance of some endemic and exotic diseases



Recent examples

- FMD incursion to Bulgaria (2011),
- ASF epidemic in the Caucasus and Russian Federation (2007-2013),
- CSF outbreaks in Latvia and Lithuania and other European countries (2011-2013).

Radical solutions to these problems?

- Local extermination of wild boar as a species (Russia, Belarus), or
- building fences to create ecological barriers to discontinue wildlife populations, thus preventing spread of disease (Bulgaria, Lithuania, Latvia, Poland), seriously considered by the governments.

- unacceptable from ecological and economical standpoint these “simple” solutions do not solve the problem, but **rather create new ones**.

Instructions available

- EU legislation ???
- Scientific Opinion /Statement /Guidance of the Panel on AHAW on a request from Commission on “Control and eradication of Classical Swine Fever in wild boar”. The EFSA Journal (2009) 932, 1-18
- Guidelines on surveillance/monitoring, control and eradication of classical swine fever in wild boar European Commission, 2010 Document SANCO/7032/2010 (EC Homepageaddress: http://ec.europa.eu/food/animal/diseases/controlmeasures/csf_en.htm)

Aims and objectives

- a comprehensive, holistic approach to address the “wild boar/wildlife problem”.
- Scientifically sound population management and wildlife health status control strategies, based on the best available knowledge, standardized and officially accepted on the pan-European scale (both in EU and non-EU countries);
- practical solutions to the disease surveillance, prevention and control efforts, including use of innovative techniques, methods and management options that are to be disseminated and incorporated into the routine work of wildlife/hunting communities

Experience so far….

- Plan for FMD control in wildlife/ BG
- Surveillance for FMD in wild boar in Thrace and Anatolia /BG,TUR
- Laboratory trials for FMD surveillance in wild boar/FLI
- Wild boar telemetry study /BG
- Trials on NI sampling /BG, SER, FLI, Nepal
- Game collection centers in case of epidemics in wildlife/GER, BG
- Trapping as alternative method to eradicate disease /BG
- Data on wildlife attendance at feeding sites and salt licks/BG

Issues addressed

- Early detection
- Standardized baits for NI sampling
- How often samples have to be recovered? (Daily/weekly/monthly)
- Evaluate the virus resistance in baits by different climates (cold vs hot temperature)
- What type of data do we need to create a database?
- Role of the WB population density
- Studying in detail the movements of each single tracked WB and its home range analysis

- interactions between different WB social groups
- interaction between wildlife population and livestock
- monitoring FMD antibody titers in wildlife
- training courses on wildlife management for farmers, hunters, veterinarians
- training courses for detection of FMD clinical signs for farmers, hunters, veterinarians
- more investigations to define the nature of FMD-like lesions in wildlife

Do we need an EuFMD adhoc group for Wildlife diseases?

Possible activities:

- NI surveillance – compile and compare
- Design and review studies on NI surveillance and wild boar/wildlife ecology/interactions
- Perform statistical analyses on the data already collected on wild boar tracking and ecology
- Publish all results

Wildlife Manual

Collate available knowledge based on the experience with disease control in wildlife in Europe into a **comprehensive manual**, including:

- host species distribution and ecology relevant to selected diseases;
- population monitoring techniques;
- surveillance protocols and recommendations;
- options for control/management/prevention of specific diseases;
- wise wildlife population management options and solutions;
- food safety, socio-economical, legal, cultural, animal welfare aspects etc.

Training activities

trainings to build up capacity and expertise among veterinary specialists, wildlife professionals, forestry/hunting authorities and on how to detect and deal with wildlife health issues

- *theoretical and practical issues in disease and disease ecology,*
- *outbreak management*
- *wildlife management,*
- *non-invasive surveillance*
- *bio-security etc.*