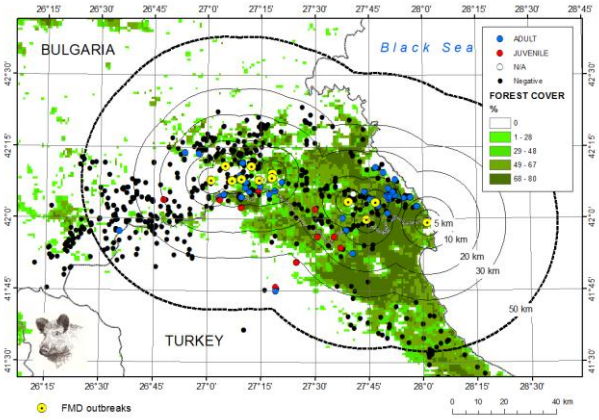


WHEN FMD GOES WILD…

LINKING ECOLOGY, EPIDEMIOLOGY AND SURVEILLANCE

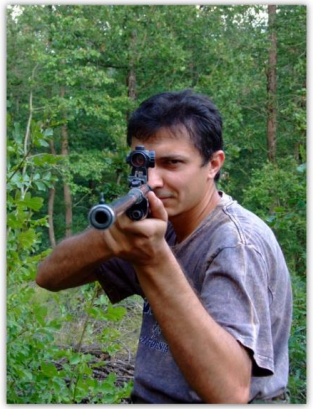
Sergei Khomenko, Tsviatko Alexandrov, Naci Bulut, Sinan Aktas, Keith Sumption

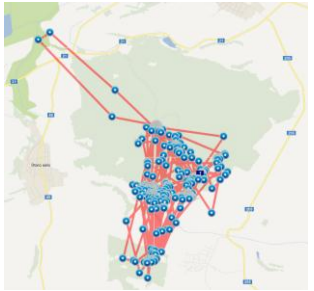
40TH GENERAL SESSION OF THE EUROPEAN COMMISSION FOR THE CONTROL OF FOOT-AND-MOUTH DISEASE Italian

Ministry of Health, Via Ribotta, 5 Rome, Italy

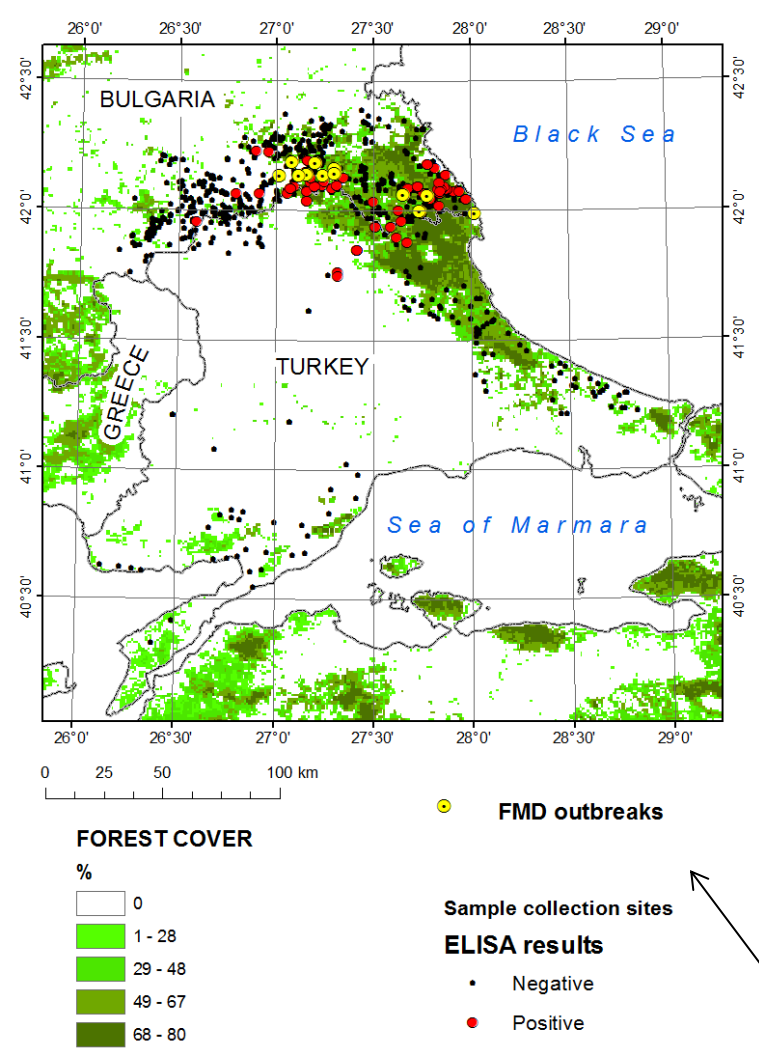
Research topics:

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



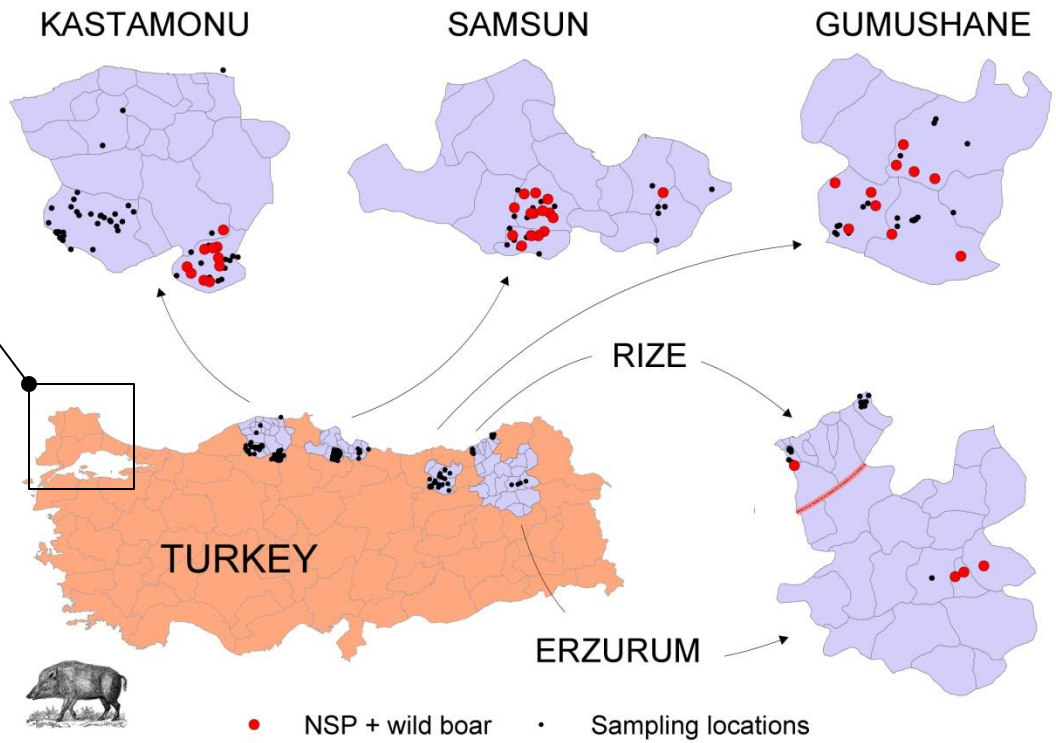


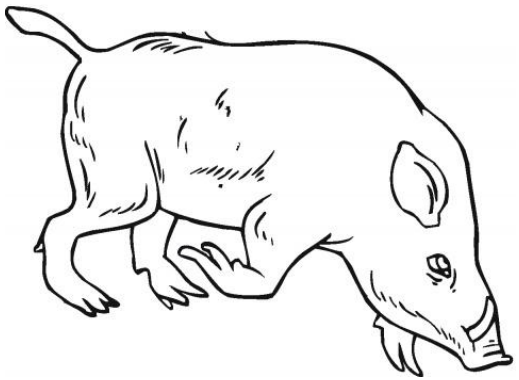
Surveillance in wild boar for FMD 2011-2012



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

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





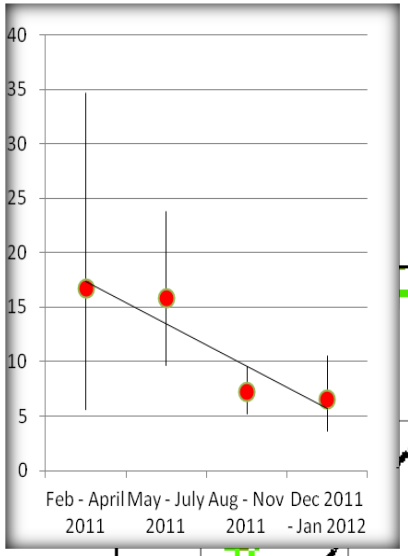
Sero-positivity to FMDV:

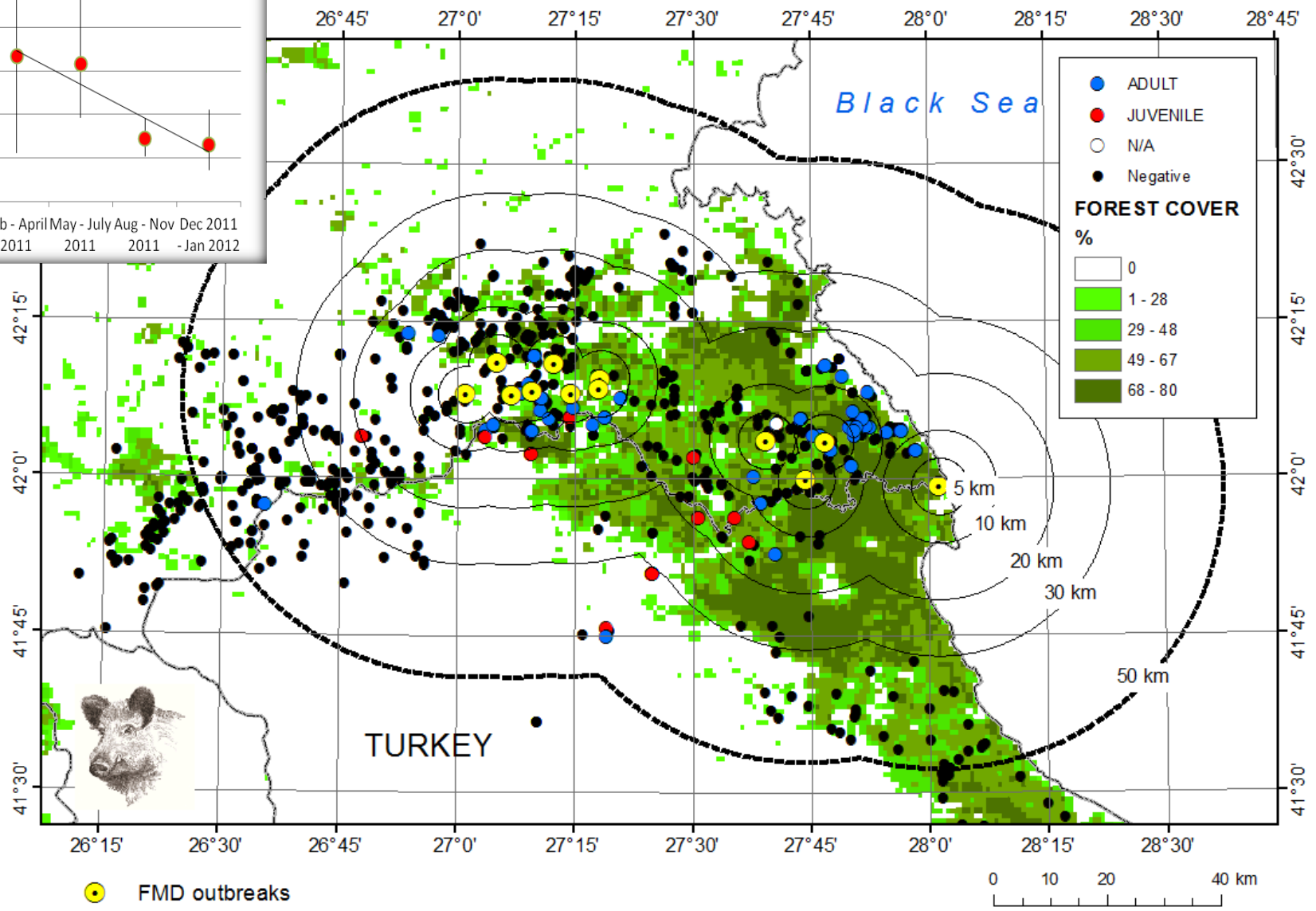
Thrace (epidemic O) *versus* Anatolia (endemic O, A, Asia)

AGE GROUP	THRACE		ANATOLIA		
	n	NSP+ (95 % CI), %	n	NSP+ (95 % CI), %	P
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

NOTE: NO DIFFERENCE BETWEEN SEXES FOUND

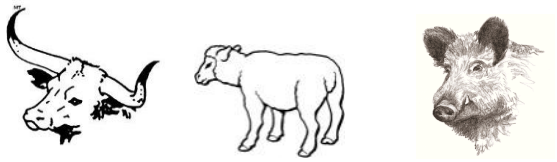
NSP + in Wild Boar in Thrace

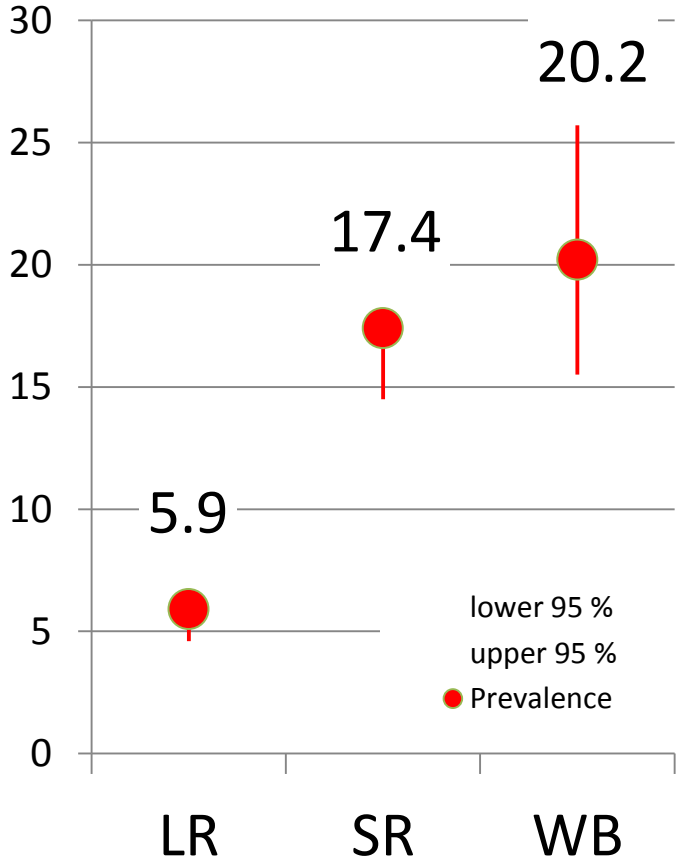




Anatolia: NSP+ in WB *versus* livestock

Average sero-prevalence in all 5 provinces of concern





- 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).

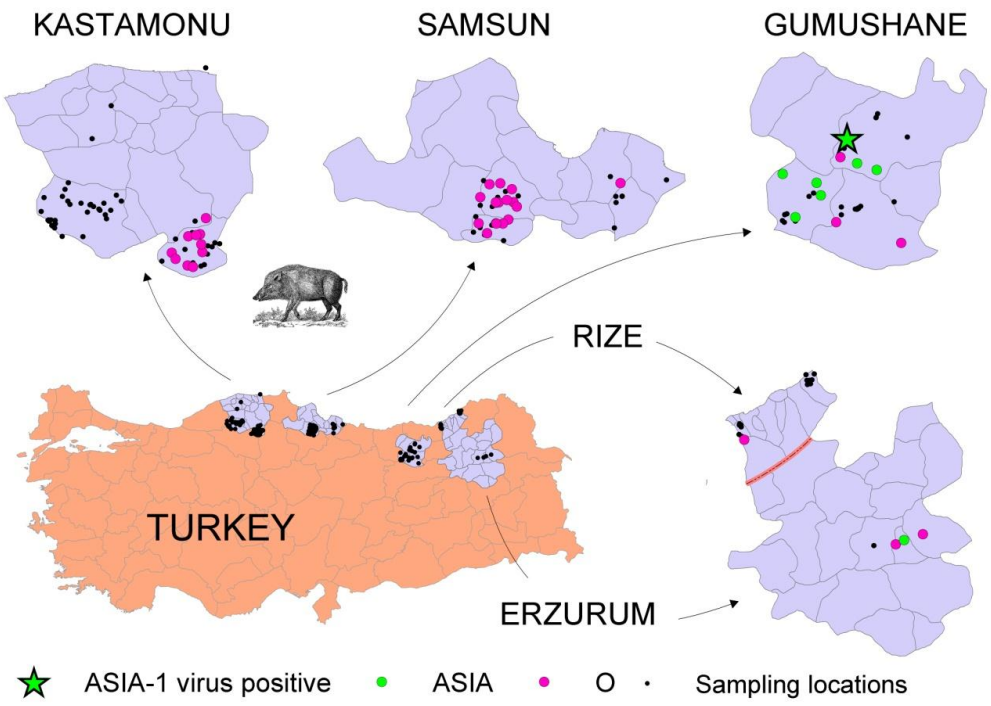
Regional variation in sero-prevalence:

60,000
infected with FMD all over Turkey !

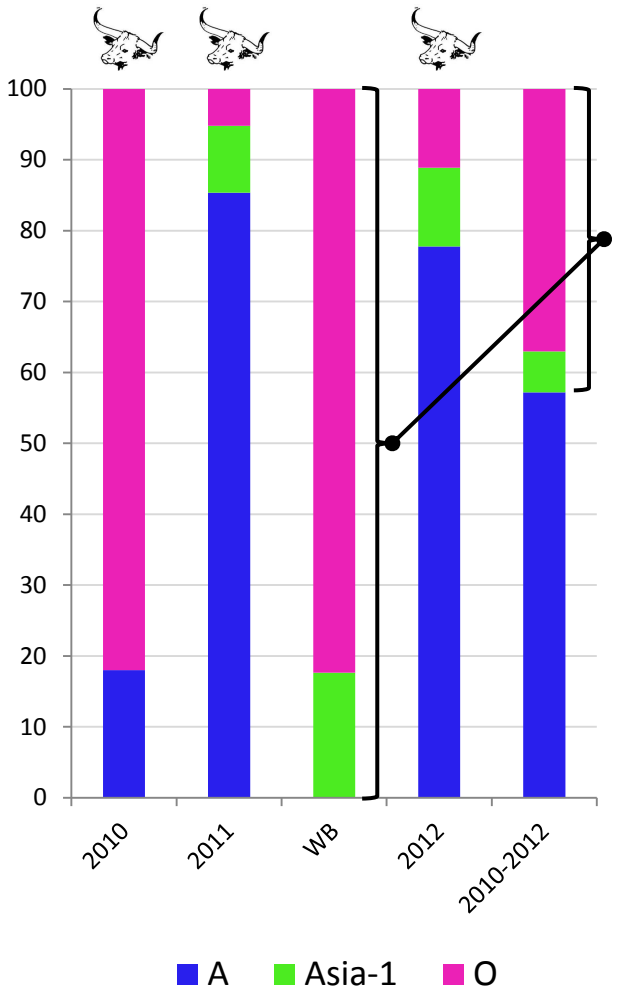
Region	n	% NSP+ (95 % CI)	% ASIA +	% O +
ERZURUM	17	**52.9** (27.8 - 77.0)	11.8	41.2
SAMSUN	73	**28.8** (18.8 – 40.6)		28.8
GÜMÜŞHANE	58	**17.2** (8.6 – 29.4)	12.1*	5.2
KASTAMONU	76	**13.2** (6.5 – 22.9)		13.2
RİZE	21	**4.8** (0.1 – 23.8)		4.8
TOTAL	252	20.2 (15.5 – 25.7)	3.6	16.7

Serotypes in livestock and wild boar seem to mismatch

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



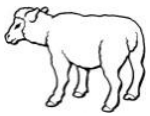
Serotype prevalence

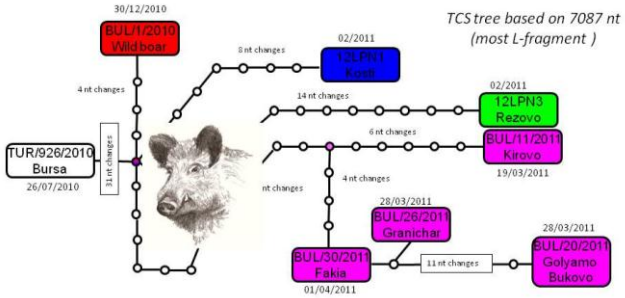


THRACE

Serotype

O





- Closely related isolates from cattle
- Isolates from wild boar

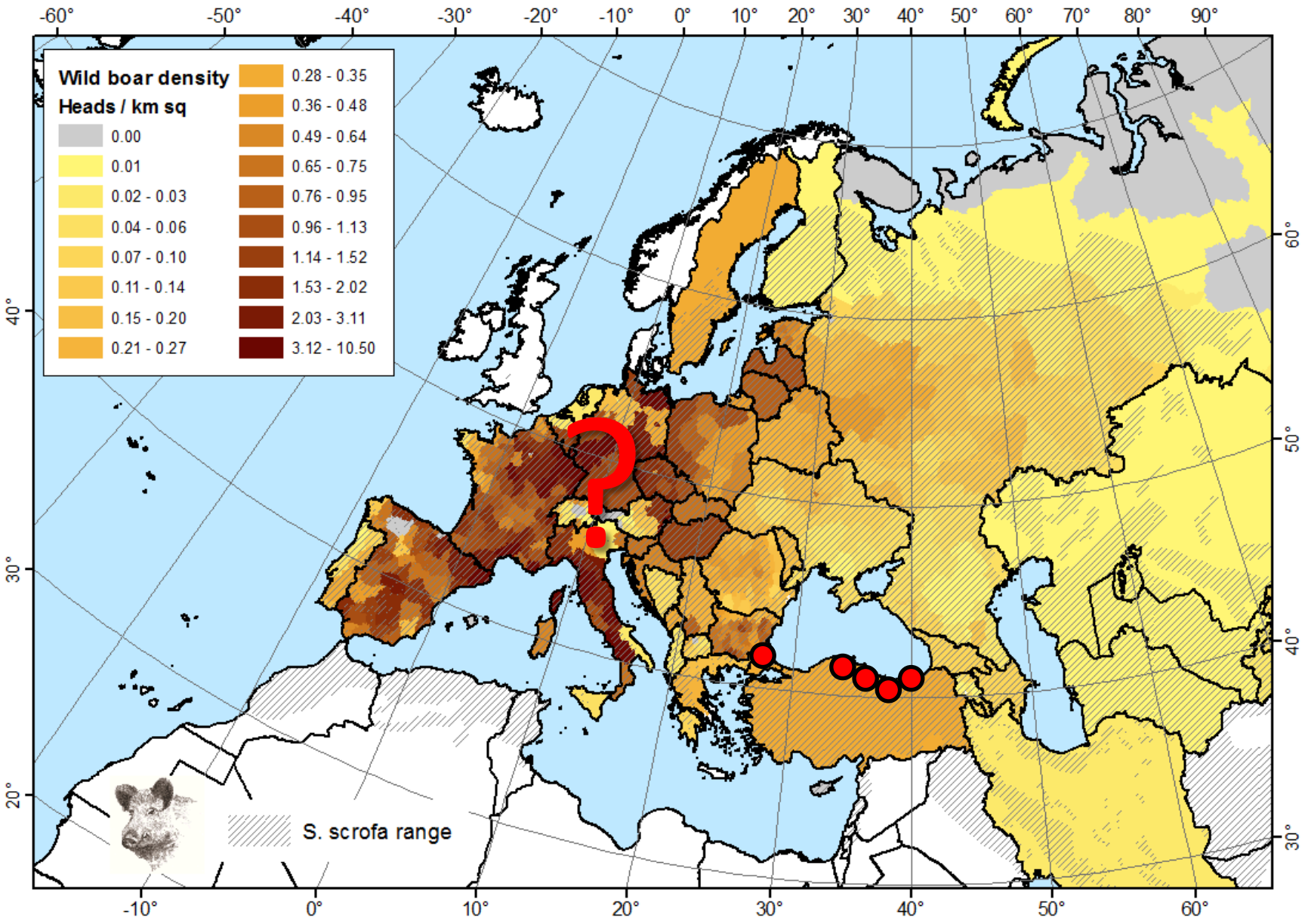
ANATOLIA

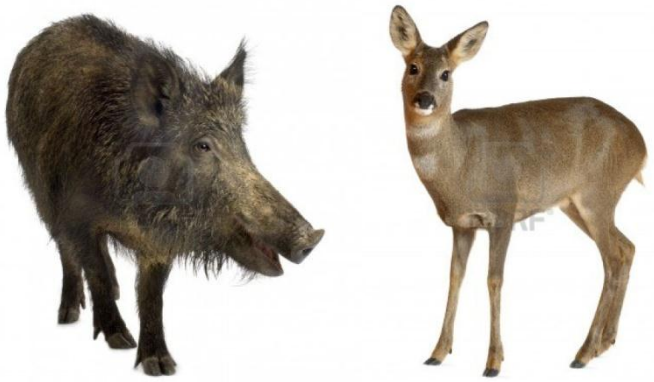
Serotype

Asia-1

Implications for disease surveillance and control

1. Wild boar and livestock can **easily exchange FMD viruses** (sharing habitats, scavenging, Kurban, hunting);
2. Epi role of **wild boar is secondary** both under endemic and epidemic conditions in livestock and **correlates well** (spatially, temporarily and serotype wise) **with disease occurrence in small ruminants**;
3. Different **serotypes may perform differently** in wild boar. O and Asia-1 seem to be better adapted than A;
4. **Winter is most risky period** for horizontal transmission of FMD in wild boar population.
5. FMD in wild boar may develop into **localised sylvatic epidemics** (3-6 months) affecting up to 20 % of wild boar and resulting in virus spread for 15-20 km.


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°
20°
30°
40°
50°
60°



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).

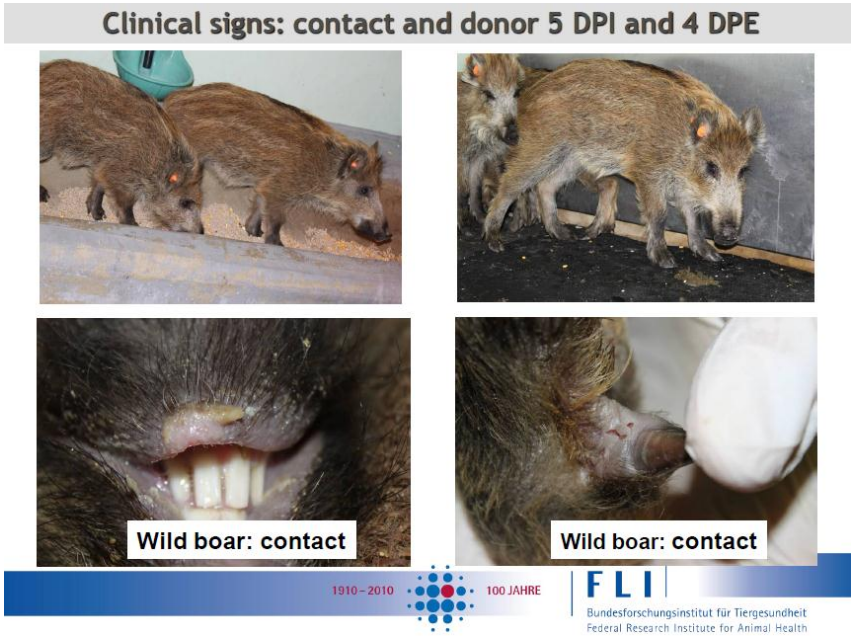
20 – 22 million FMD susceptible ungulates after reproduction

- 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)*

Way forward and milestones

1. Selection of bait prototypes and pilot testing of their performance (Bulgaria, Ukraine) - *done*;
2. Bait exposure experiments with wild ruminants (Bulgaria) and FMD infected domestic pigs (Nepal) - *done*;
3. Testing samples for species DNA (Serbia) and FMD (Pirbright) – *samples submitted*;
4. Laboratory experiment: 4 FMD infected wild boar to be sampled conventionally and with the NI method simultaneously for 30 days (Russia) - *negotiated*;
5. Field testing of the method in (Turkey and / or Nepal) - *planned*.

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**

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).

Telemetry project

FOLLOWIT
Keep track of everything.

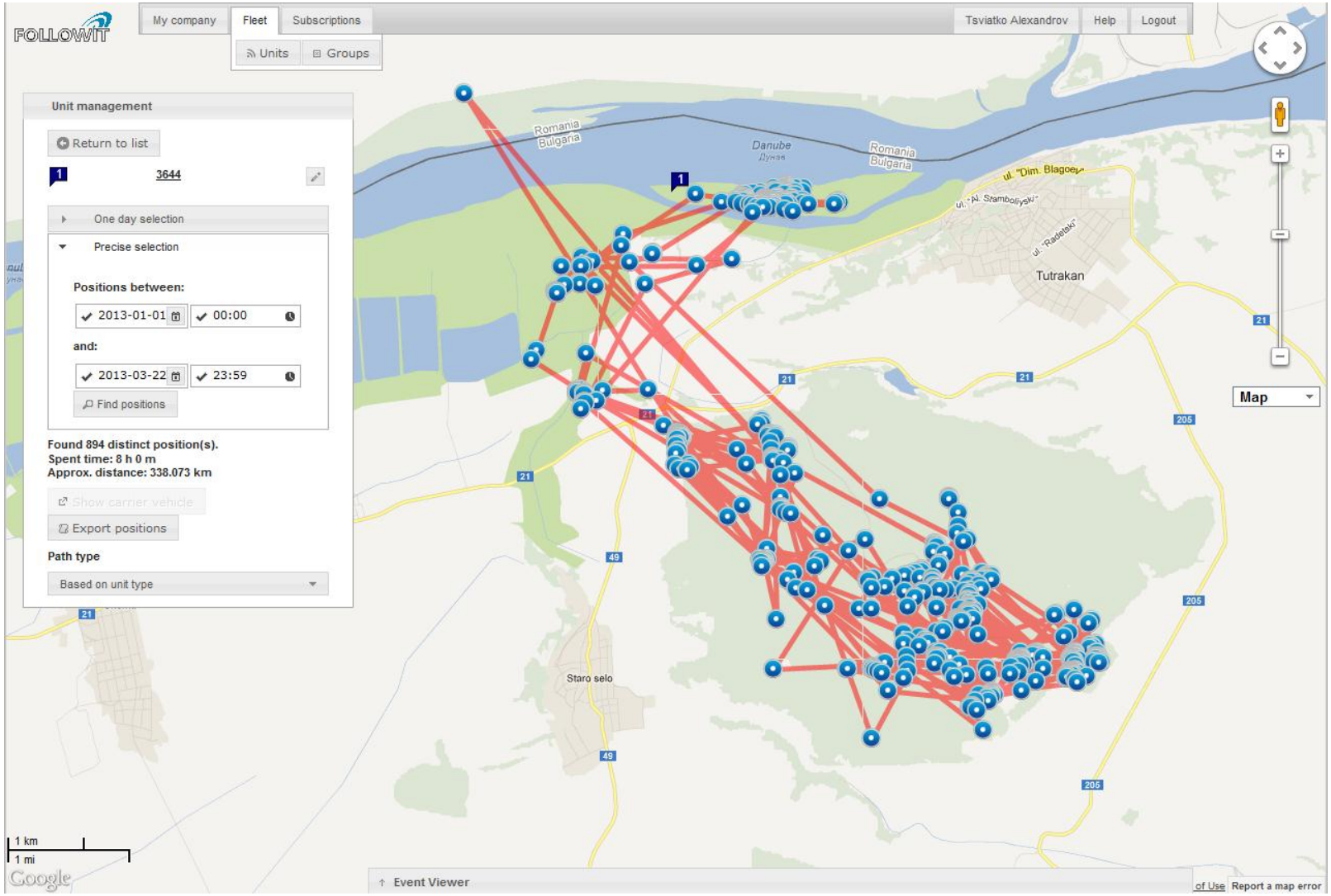
- 20 GPS/GSM Tellus collars (1 year – 24 fixes a day);
- 19 animals collared, 16 collars used (6 reused), 4 were destroyed / failed, 1 - lost;
- 9 animals still give signal;
- More to collar …

Strandzha – 4 (2)

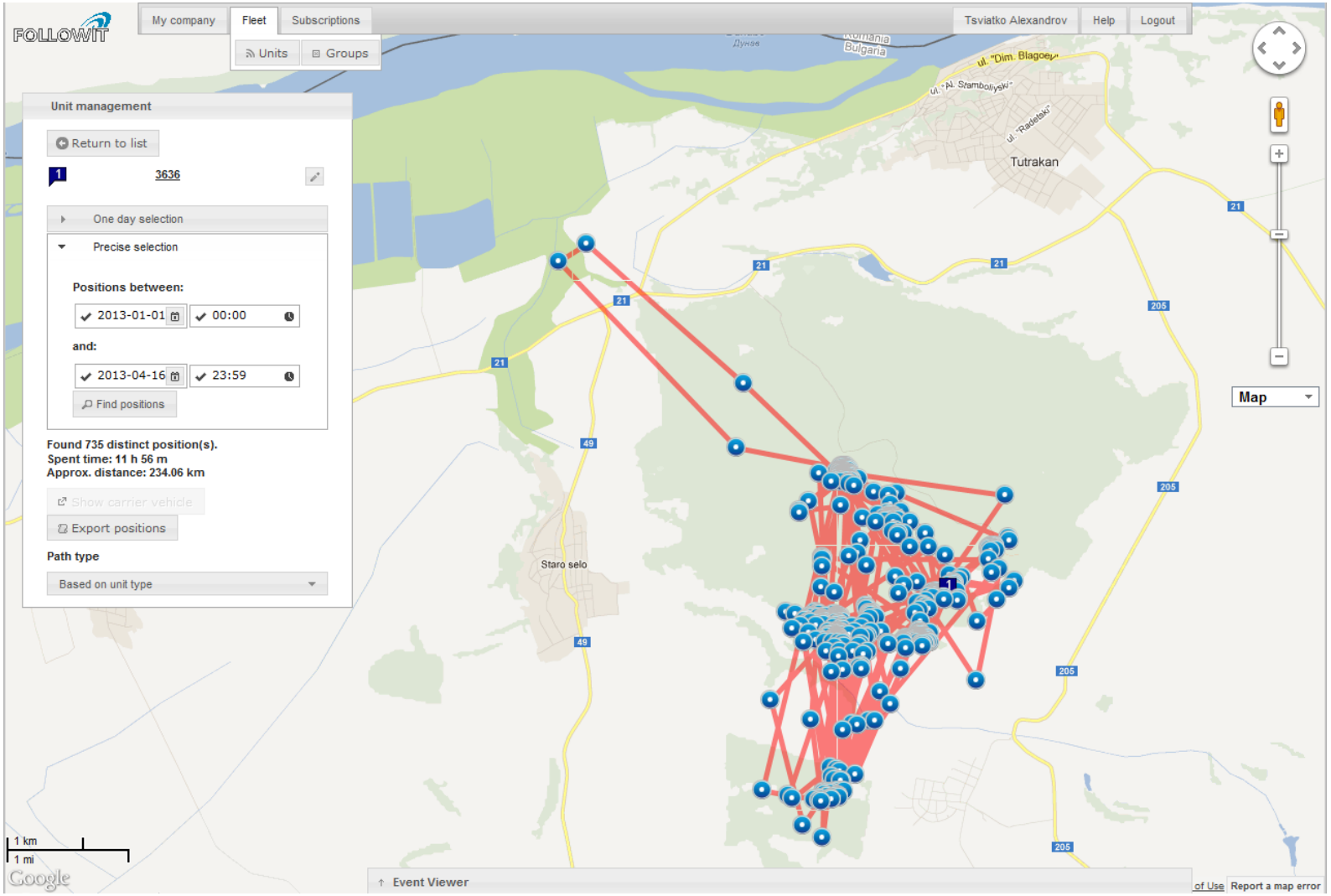
Tutrakan – 15 (7)

http://www.followit.se/wildliferesearch.html

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



5 yr female – 13 Feb – 16 April – 735 positions – a total of 234 km



What we want to know

- Sex, age, and seasonal variation in home ranges and movement patterns;
- Habitat use, including attendance of feeding sites and crops;
- Individual and group interactions in space and time to simulate disease spread;
- Response to management interventions (hunting and supplementary feeding).

What's next and perspectives:

- Further field tails of the NI surveillance methodology, including other countries, situations, and diseases;
- Collaboration with other projects as for spatial ecology studies (e.g. ASFORCE);
- Development of a training course on FMD surveillance and management in European wildlife ???
- Development of a wild boar disease surveillance, management and control manual ???

THANKS TO ALL