



Better Training for Safer Food *Initiative*

ASF EPIDEMIOLOGY

VITTORIO GUBERTI ISPRA, ITALY

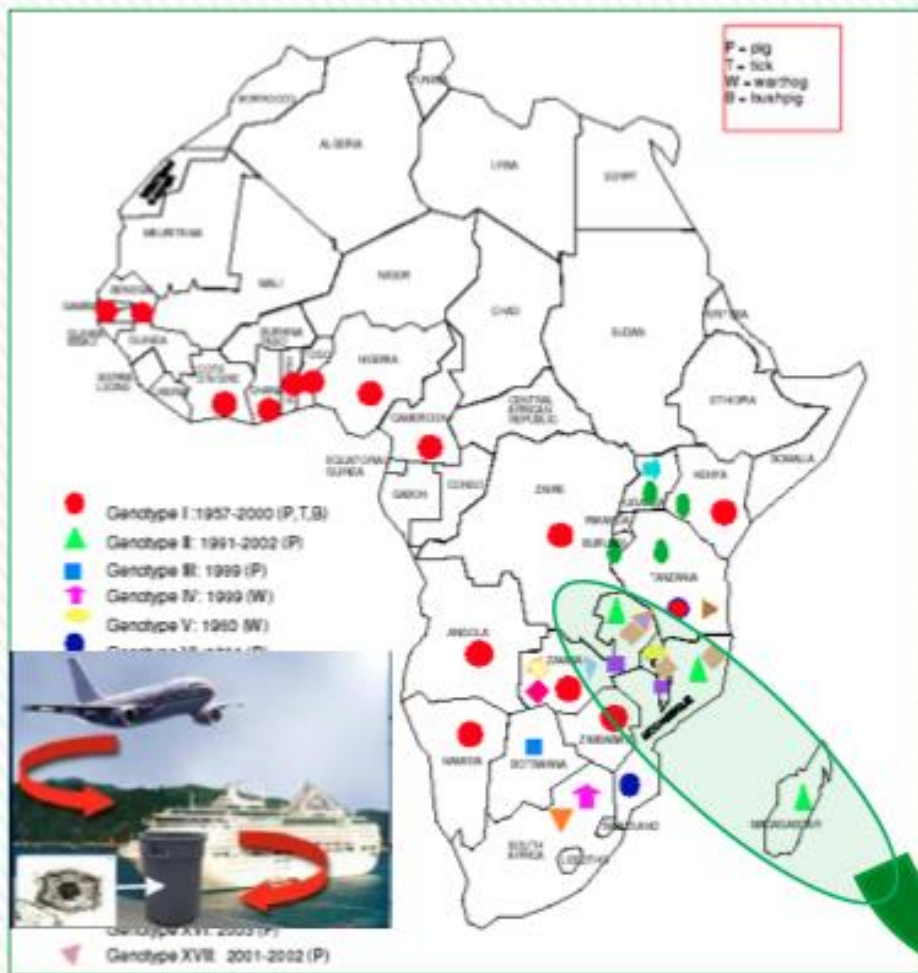
AFRICAN SWINE FEVER

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BTSEF

Belgrade, Serbia 6-8/11/2018

Tracing the origin



Georgia June 2007



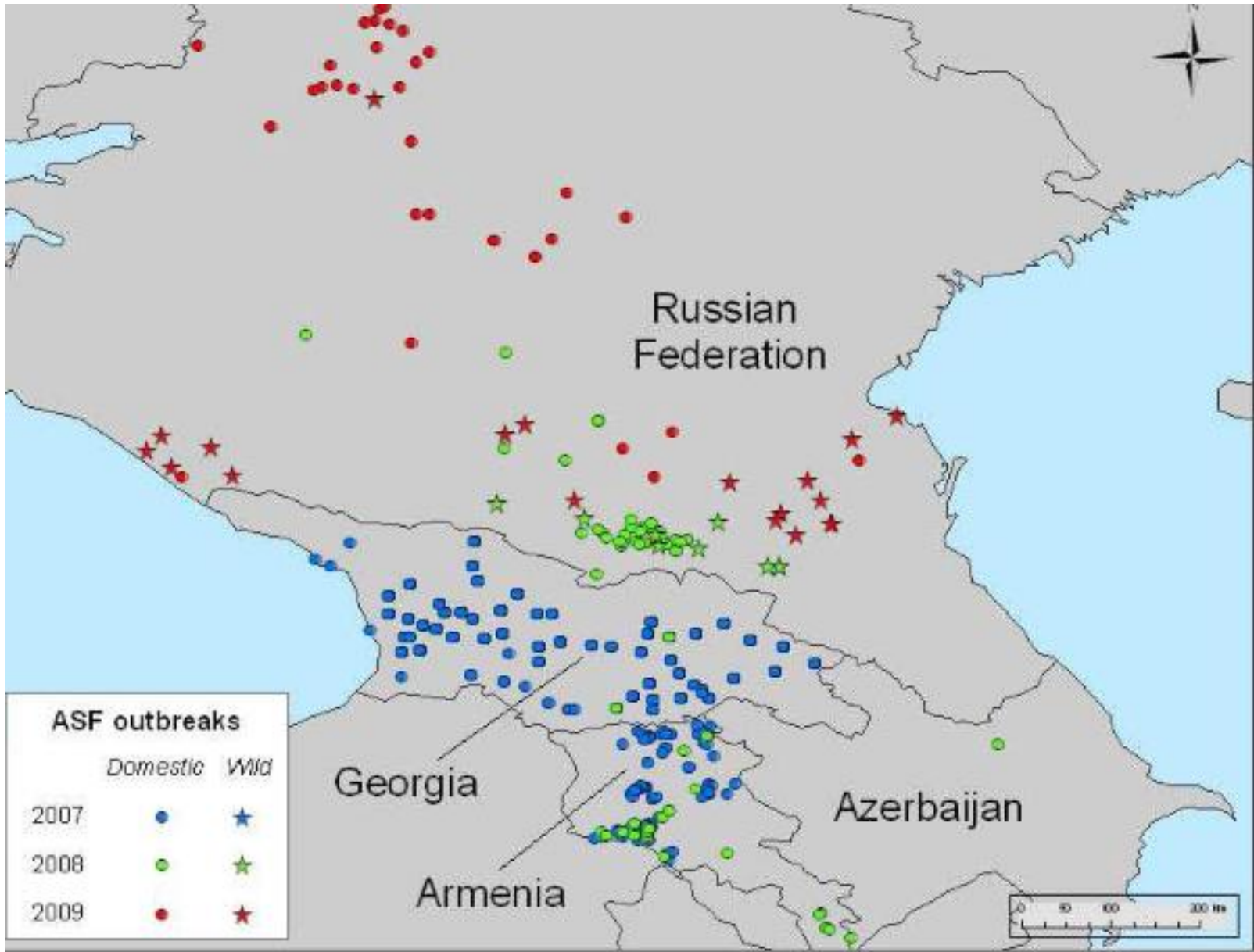
Europe

- International Boundary
- Road
- River
- ★ National Capital
- City or Town

0 250 500 KM
0 250 500 Miles

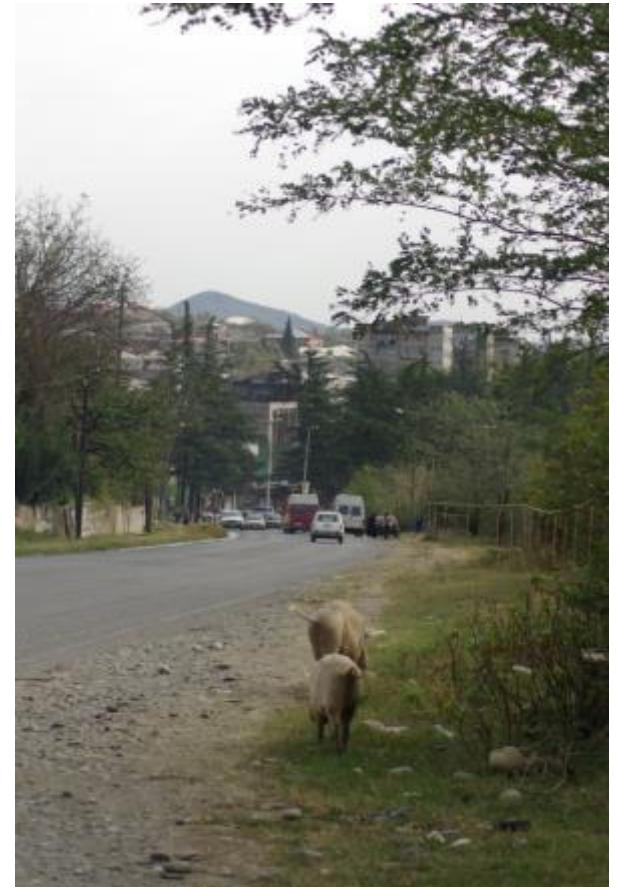
© 2007 Geology.com





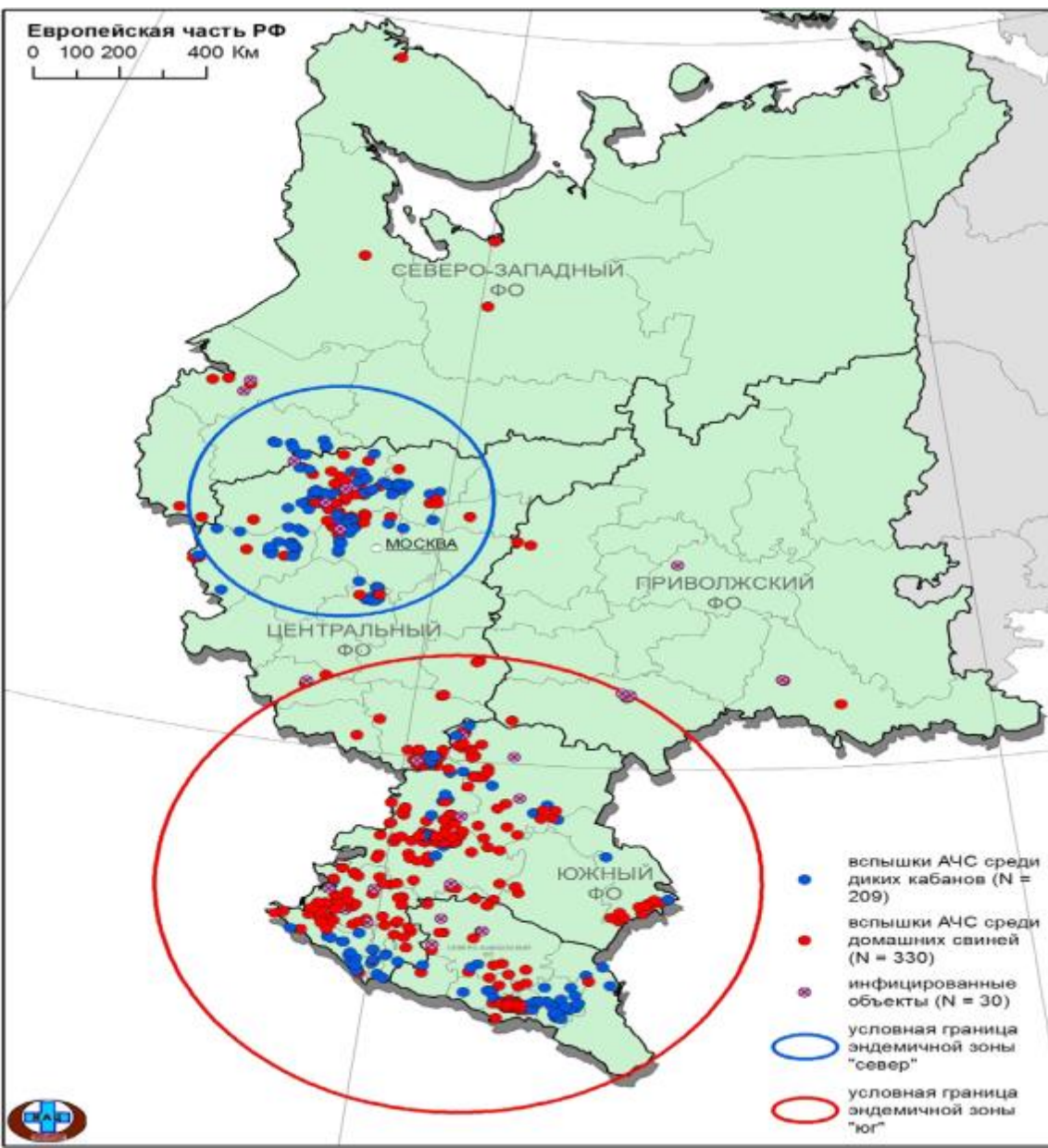


Biosecurity measures

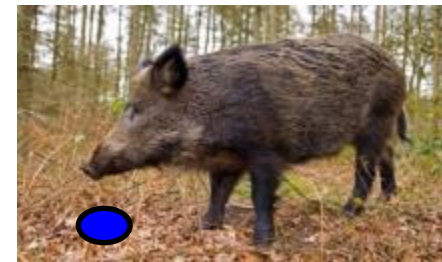


Caucasus: ASF persistence and spread

- 98% of pigs in the back yard sector
- Absence of the minimal biosecurity measures
- 80% free ranging pigs
- Veterinary Services weak and/or privatised
- Lack of any legislation on Veterinary profession
- Absence of compensation (home slaughtering and selling of diseased pigs)
- Old and/or privatised Veterinary Faculties
- Few abattoirs (1-2 in the countries)
- Lack of equipped laboratories

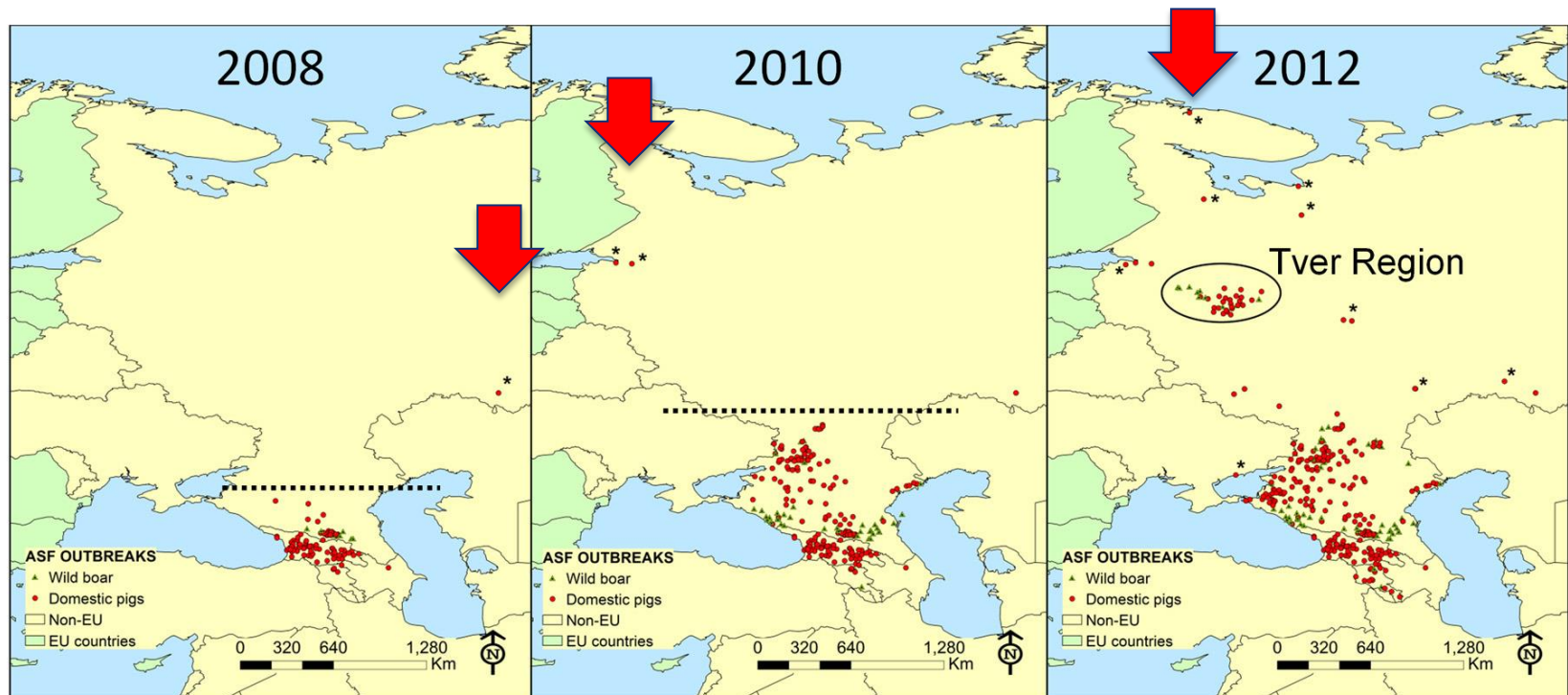


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1. The anthropogenous factor is the leading one in the spread of ASF in Russia.
2. The backyard livestock is the main target population for ASF.
3. There is a trend of diffuse spreading of ASF in the territories bordering on primary and secondary epidemic zones.

Unexpected long distance spread of the virus



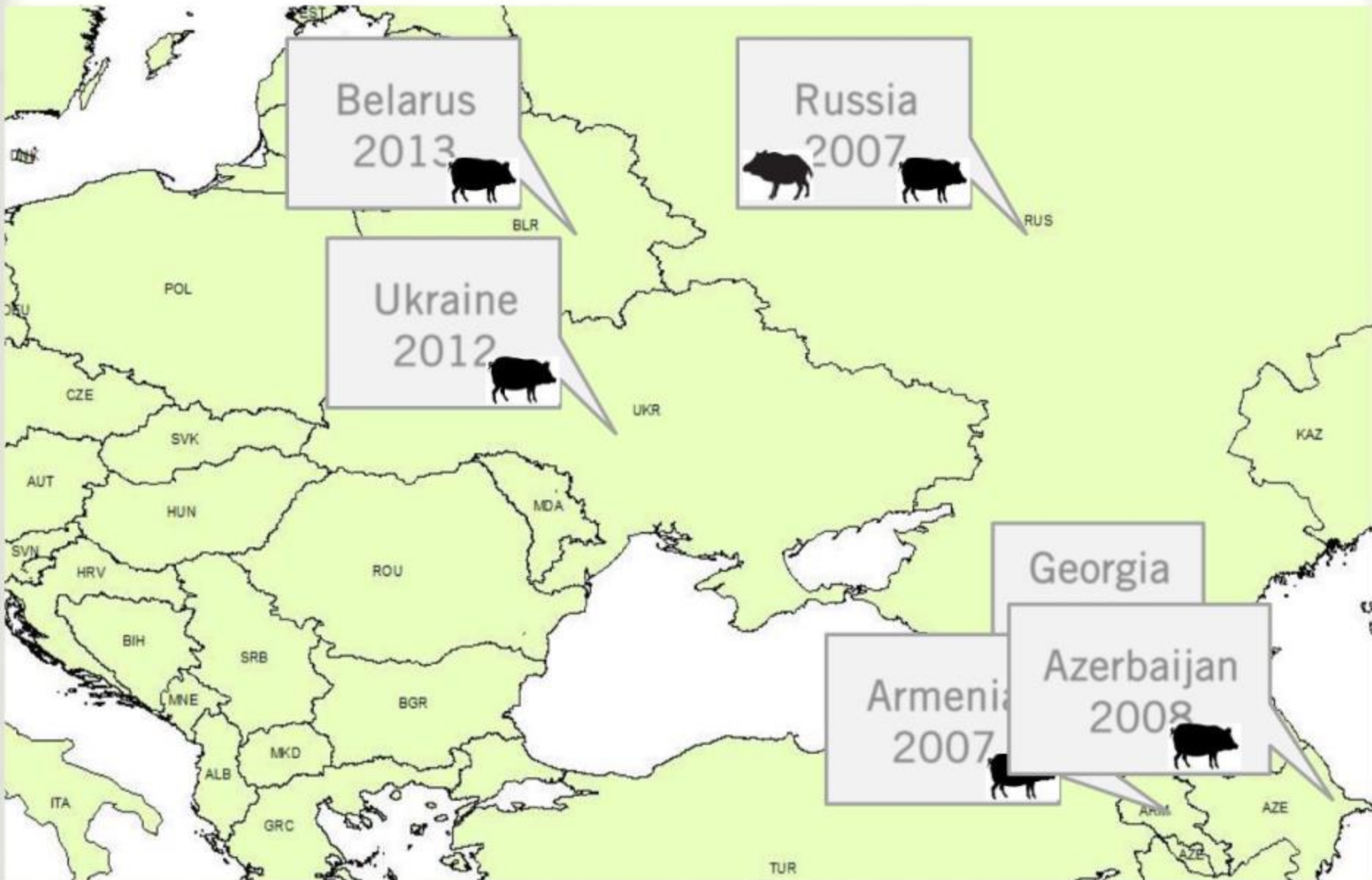
What does it mean?

- ASF is in some locality
- ASF is not locally controlled/eradicated
- After a certain period the virus is carried/transported by humans from the infected locality to another distant – free - area;
- The cycle starts again

- LOCAL PERSISTENCE and long distance transport of the virus

- Each new arrival of the virus initiates a new local persistence.....that – sooner or later – will originate another long distance spread: a new infected area

Non EU countries





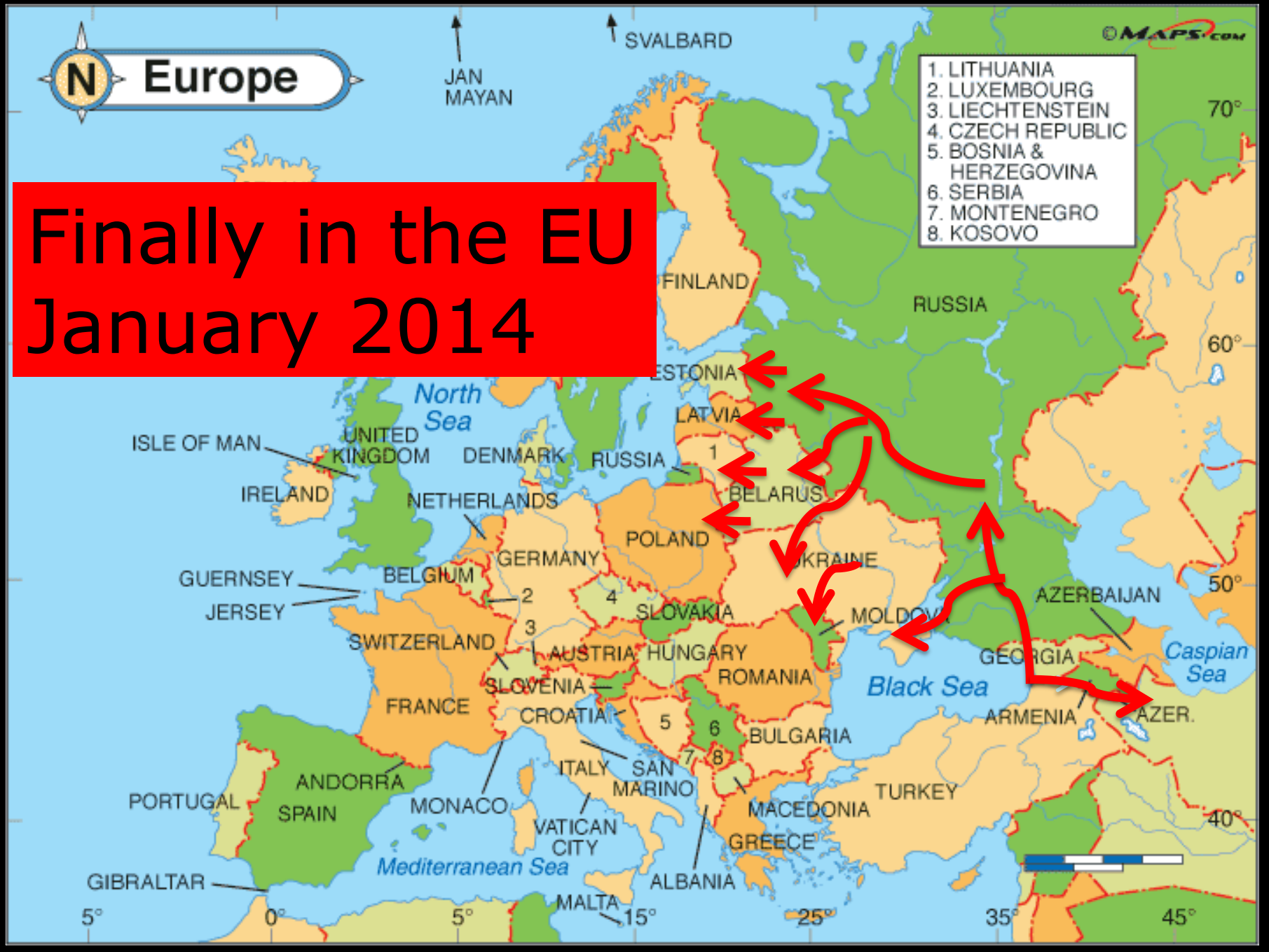
JAN
MAYAN

SVALBARD

© MAPS.COM

1. LITHUANIA
2. LUXEMBOURG
3. LIECHTENSTEIN
4. CZECH REPUBLIC
5. BOSNIA & HERZEGOVINA
6. SERBIA
7. MONTENEGRO
8. KOSOVO

Finally in the EU
January 2014

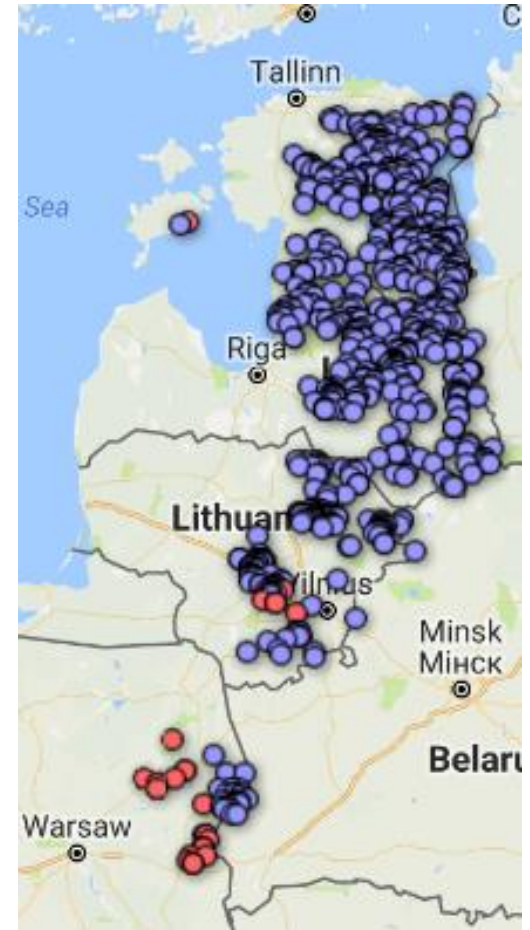


ASF in Baltic countries and Poland

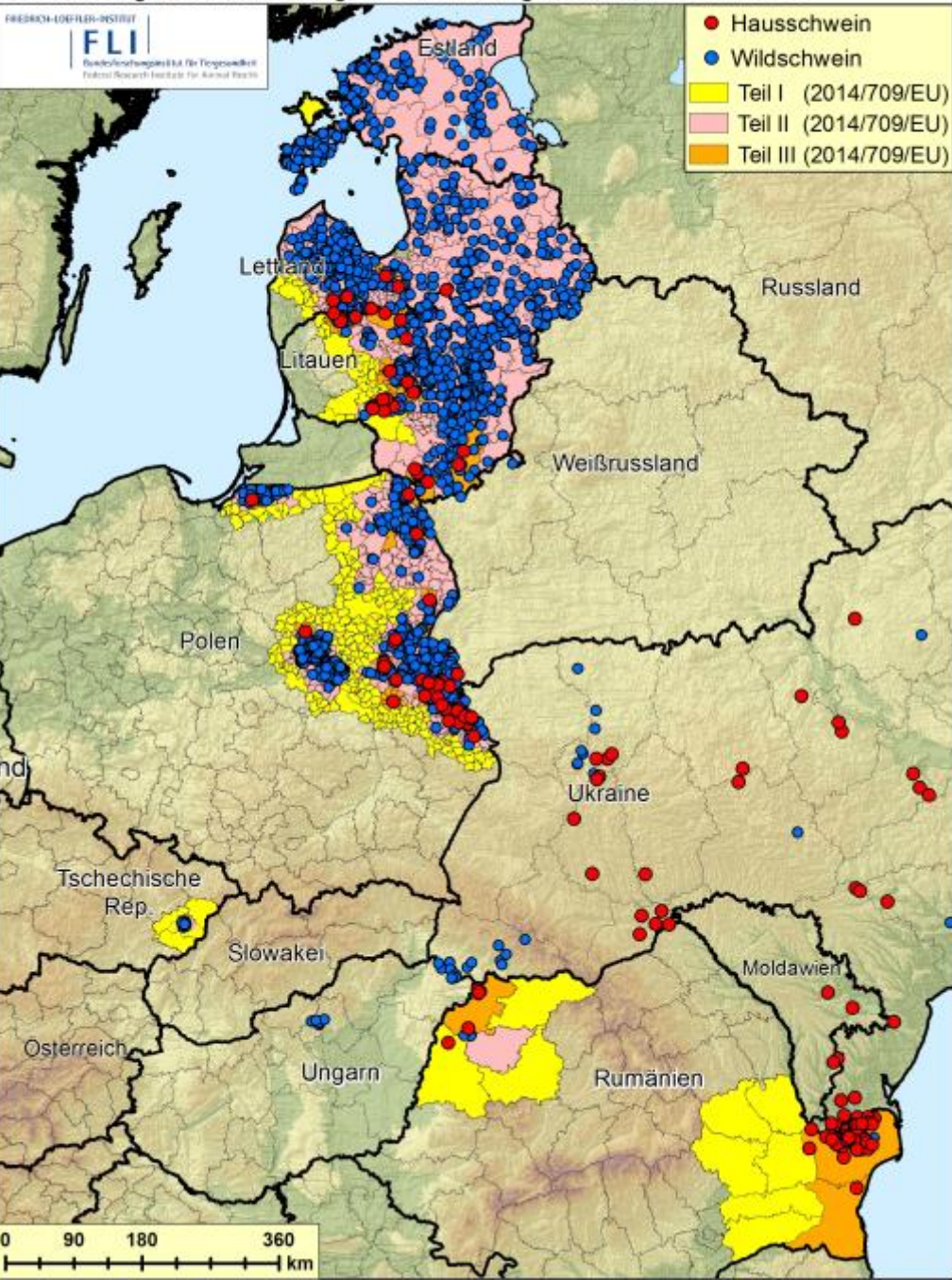
2014

2015

2016

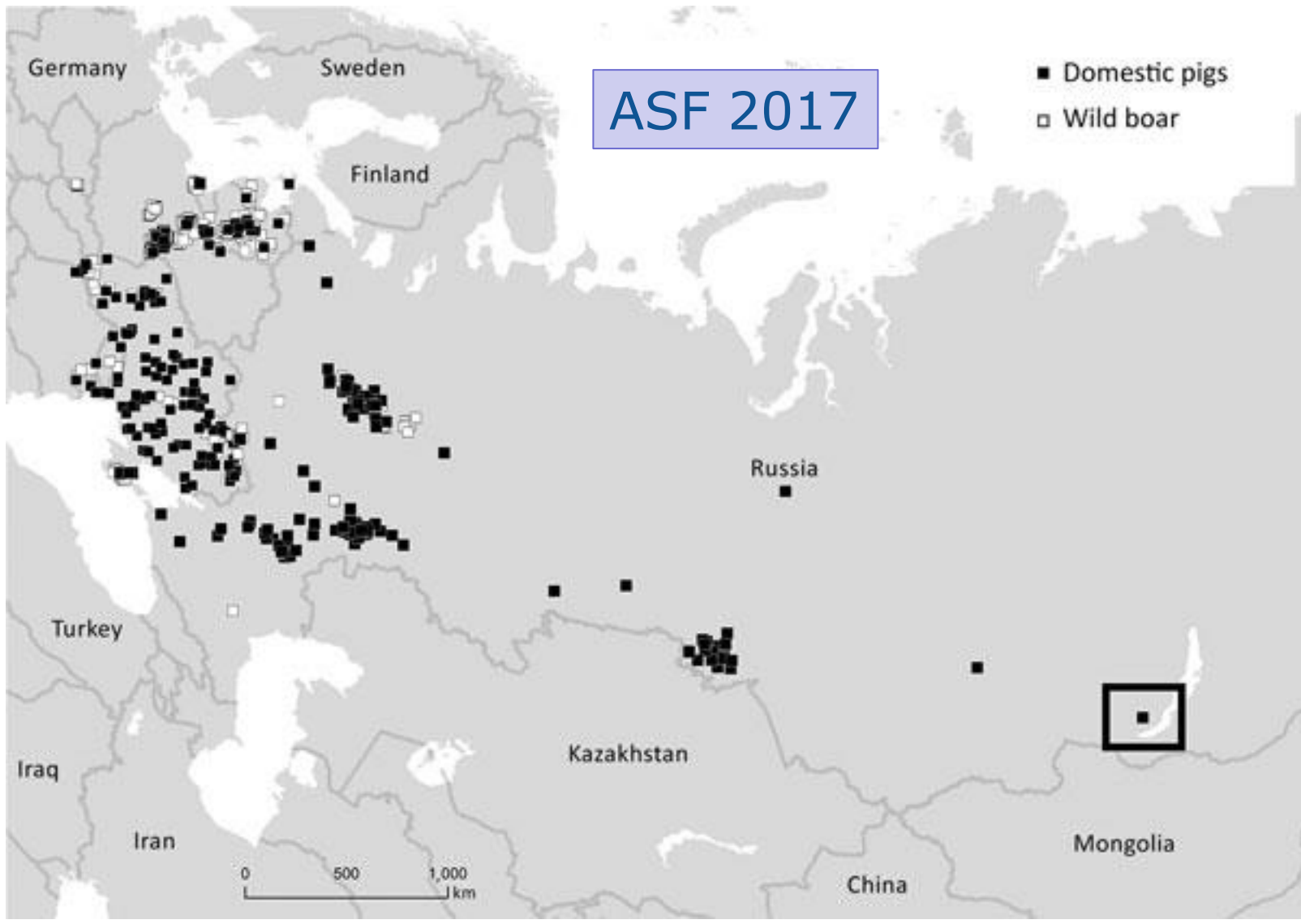


Afrikanische Schweinepest im Baltikum, Moldawien, Polen, Rumänien, Tschechien, Ungarn und Ukraine 2018 Datenquelle: ADNS, OIE (Stand: 11.07.2018 - 09:00 Uhr); Restriktionsgebiete nach Anhang des Durchführungsbeschlusses 2014/709/EU

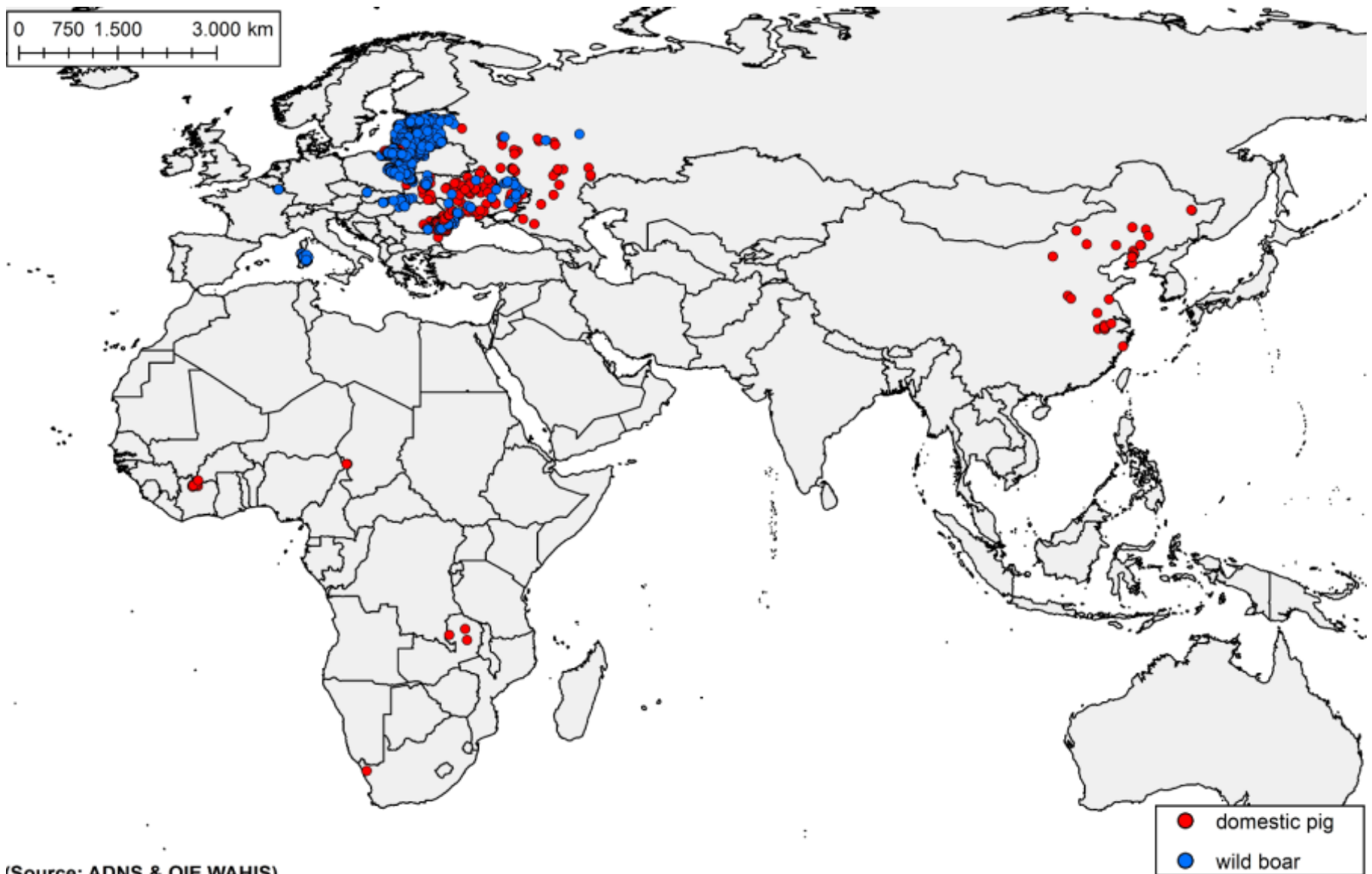
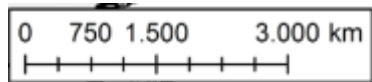


INVOLVED
in the sole European Union
250.000 kmsq
About 300.000 wild boars

ASF 2017



ASF 2018



(Source: ADNS & OIE WAHIS)

| Country | Outbreaks^(a) in domestic pigs | Cases^(b) in wild boar | |
|----------------|---|---|---------------|
| | | Found dead | Hunted |
| Lithuania | 118 | 4969 | 792 |
| Poland | 213 | 4361 | 335 |
| Latvia | 63 | 2371 | 2226 |
| Estonia | 27 | 3844 | |
| Czech Republic | 0 | 211 | 19 |
| Romania | 990 | 87 | 10 |
| Hungary | 0 | 34 | 2 |
| Bulgaria | 1 | 0 | 0 |
| Belgium | 0 | 3 | 15 |
| | | | |

Scientific Opinion on African swine fever

(*EFSA Journal 2014;12(4):3628*)

All domestic outbreaks in all infected countries

Table 1: Main sources and routes of transmission established during the outbreaks of ASF in domestic pigs in years 2008-2012

| Source and transmission of virus | | |
|--|--------|-----|
| | Number | % |
| Selling infected pigs | 1 | 0,3 |
| Neighbourhood (infected pigs in backyards) | 5 | 1,7 |
| Direct contact with humans (having a meal right at the farm) | 1 | 0,3 |
| Contact during transportation, shipping, movement | 108 | 38 |
| ASFV infected wild boar | 4 | 1,4 |
| Swill feeding | 100 | 35 |
| Not established | 65 | 23 |
| Total: | 284 | 100 |

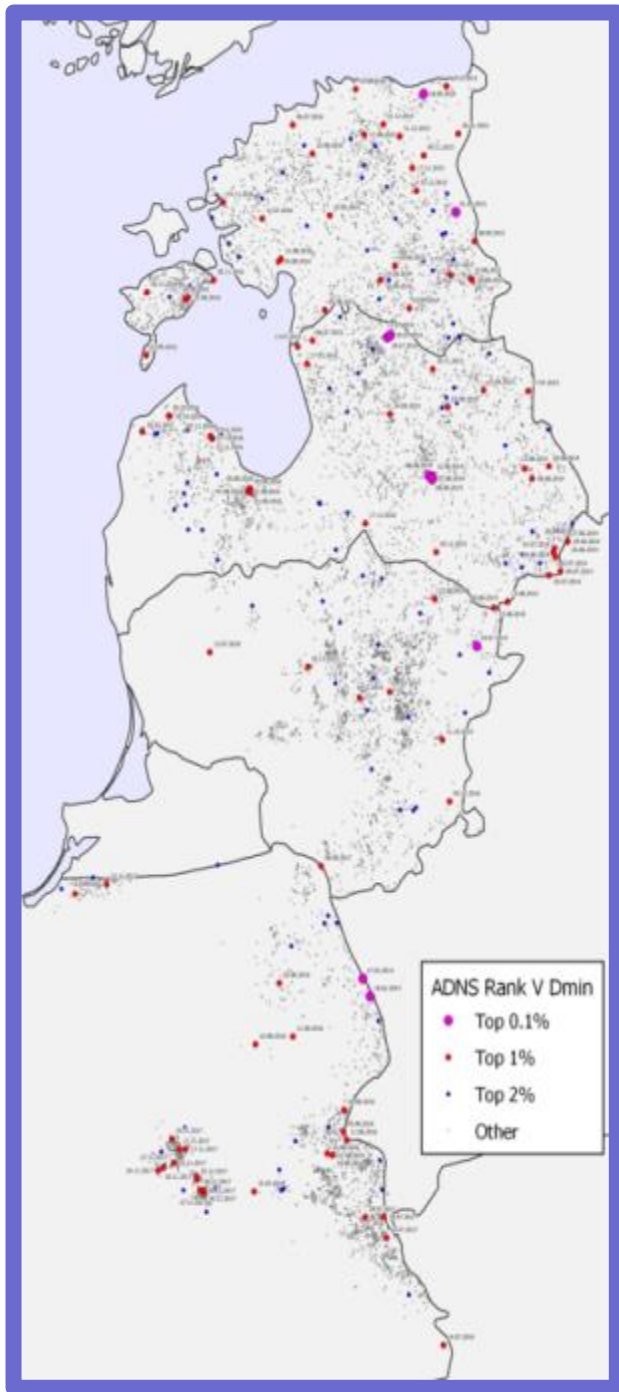
Source: Belyanin, 2013

ASF in the back yard sector in Estonia

| Year/ No of the Outbreak | Total No pig s | Herd type | Outdoor access | Feeding Grass | Contamination of feed ¹ | Contamination of bedding | Production animals in barn | Pets in barn | Owner hunter | Berry picking |
|-----------------------------------|-------------------------|--------------|-------------------|------------------|---------------------------------------|--------------------------------|----------------------------------|--------------------|-----------------|------------------|
| 2015/1 | 1 | Fat | | | X | | | (Cats) | | X |
| 2015/7 | 3 | Fat | | | X | | Chicken | Cat | | |
| 2015/8 | 2 | Fat | | (X) ² | X | | Cattle | | (X) | X |
| 2015/13 | 5 | Fat | | | X | | | Cats | | |
| 2016/19 | 6 | Fat | X | X | X | X | Cattle ³ | (Cats) | | |
| 2016/20 | 7 | Fat | | | | | Cattle | Cat | | |
| 2016/21 | 3 | Fat | | X | X | X | | Cat | | X |
| 2016/22 | 5 | FF | | X | X | | Cattle | Cat, Dogs | | |

Estonia: commercial farms

| Year / No of the outbreak | Total No pigs | Herd type | Other animals in barn | Possible contamination of bedding | Possible contamination of feed ¹ | Other vehicles on the territory | Missing fence | Inadequate disinfection of vehicles entering the territory | Inadequate disinfection of people or equipment at barn entrances | No separation in changing room ² | Miscellaneous |
|---------------------------|---------------|-------------------|-----------------------|-----------------------------------|---|---------------------------------|---------------|--|--|---|-------------------|
| 2015/2 | 186 | Br ^d | | | X | Car | X | NA ⁴ | X | NA | Owner is a hunter |
| 2015/3 | 355 | Fat ^a | | X | X | Car, Farm machine | X | NA | X | NA | |
| 2015/4 | 32* | FF | cat | | X | | | NA | X | NA | |
| 2015/5 | 487 | FF ^b | cattle, cats | | X | Farm machines | | NA | X | X | Grass feeding |
| 2015/6 | 1186 | FF | | | X | Farm machines | X | | X | X | |
| 2015/9 | 2149 | Fat | | | | | | | (X) | | |
| 2015/10 | 6426 | Br ^b | cats | X | | Cars | | X | (X) | X | |
| 2015/11 | 3060 | FF | | | X | Farm machines | | X | (X) | X | |
| 2015/12 | 1847 | FF | dog | | X | | | | (X) | X | |
| 2015/14 | 2480 | Br ^b | | | | Cars | | X | (X) | X | |
| 2015/15 | 126 | FF ^{b,6} | | | X | | | X | NA | NA | Outdoor keeping |
| 2015/16 | 3804 | Fat | | | | | | X | X | X | |
| 2015/18 | 104 | FF ⁶ | | | X | Farm machines | | X | X | X | |
| 2016/23 | 4091 | FF | cats | | | | | X | X | X | |
| 2016/24 | 2736 | Fat | | | | | X | NA | X | | |
| 2017/25 | 3415 | Fat | | X | | | | | X | | |
| 2017/26 | 3232 | Fat | (cats) | X | | | | | X | | |
| 2017/27 | 6418 | FF | | | | | | | (X) | | |



Possible human
mediated
Outbreaks/cases

Natural spread through wild boar

| Country | Distance | Time | Speed of propagation (km per year) | | | | |
|-----------|----------|---------|------------------------------------|-------------|------|-----------------------------|-----------------------------|
| | | | P-25 | Median | P-75 | Mean (including extreme) | Mean (excluding extreme) |
| Estonia | Closest | Closest | 3.6 | 10.2 | 36.1 | 166.9 | 19.0 |
| Estonia | Closest | >7days | 3.3 | 9.0 | 27.0 | 38.7 | 13.9 |
| Latvia | Closest | Closest | 2.9 | 9.4 | 38.3 | 317.3 | 19.7 |
| Latvia | Closest | >7days | 2.8 | 8.2 | 28.7 | 55.3 | 14.4 |
| Lithuania | Closest | Closest | 4.4 | 16.3 | 62.9 | 515.4 | 33.5 |
| Lithuania | Closest | >7days | 3.9 | 12 | 37.8 | 83.5 | 18.9 |

The evolution of ASF epidemiology from Africa to Europe

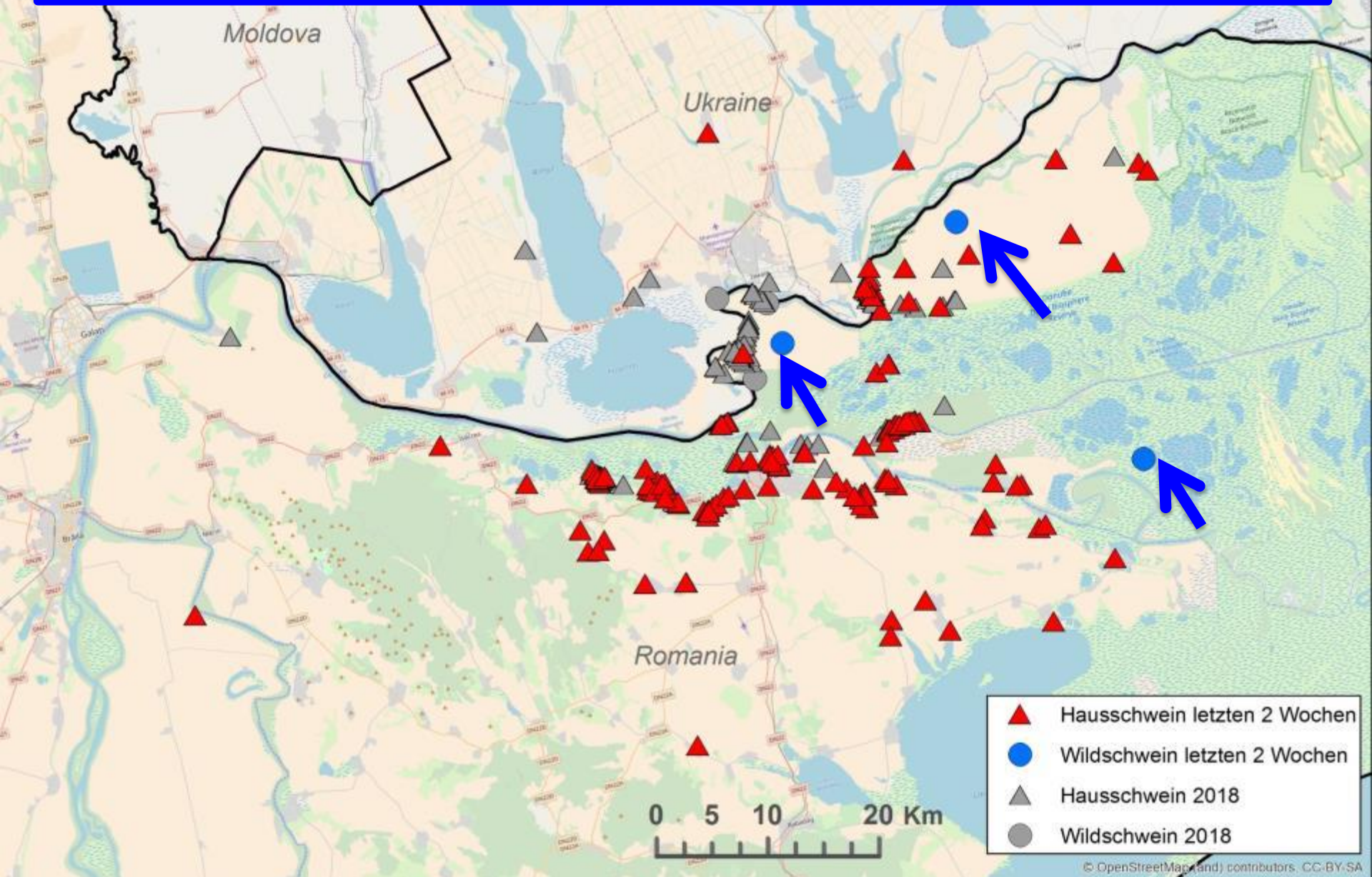


ASF in the EU: few certainties

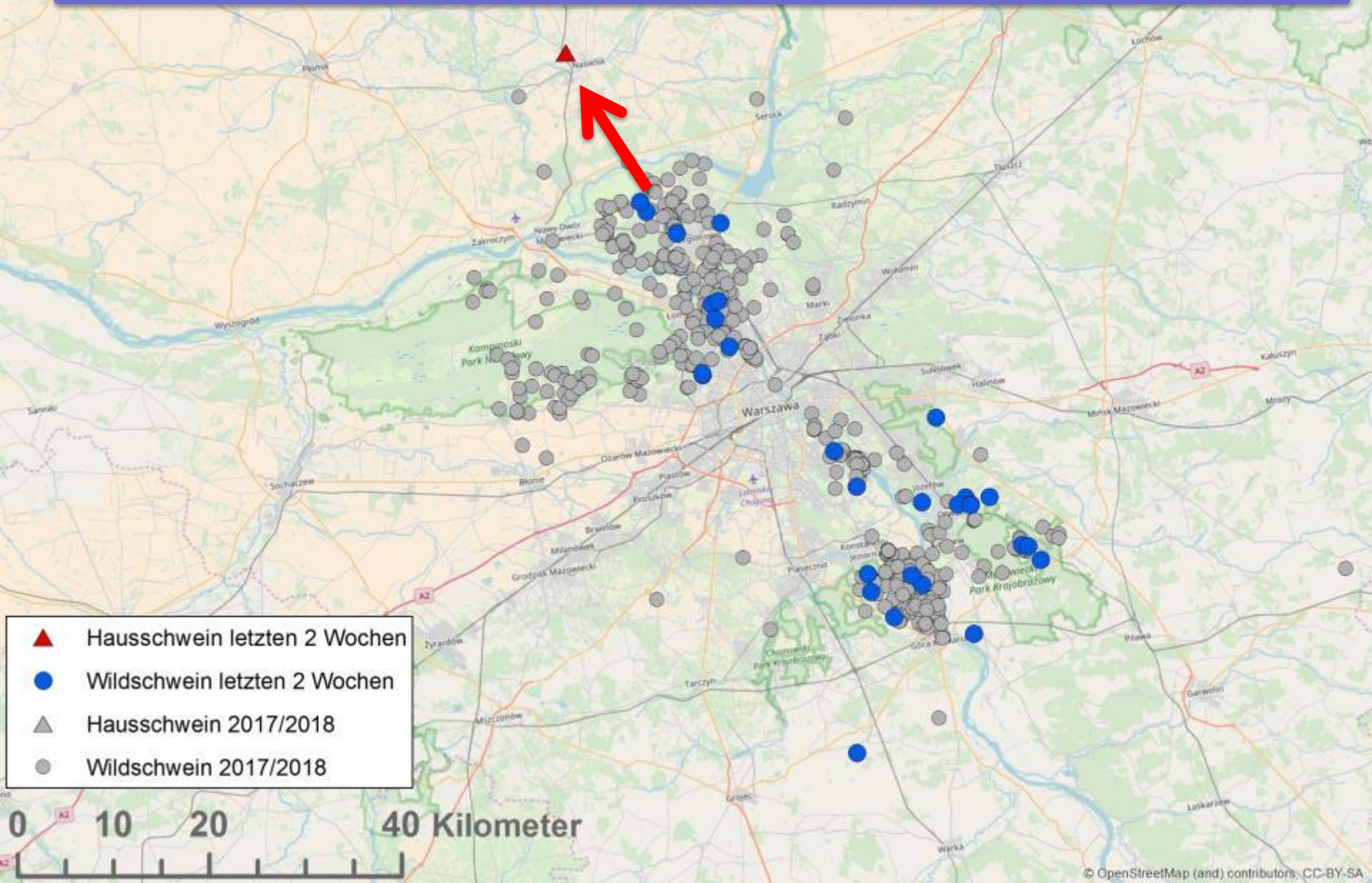
Two main cycles: Wild boar cycle and the back yard cycle often interconnected

- ❑ North East European Union: wild boar is the true epidemiological reservoir of the virus;
- ❑ In some non EU countries and South *East* EU (Danube delta, Romania) the back yard sector is the main reservoir of the disease

Back yard cycle (Romania Danube delta)



Poland, wild boar cycle in Warsaw



Back yard pig cycle

- *Absent biosecurity*
- *Widespread in remote, poor areas*
- *Human mediated*
- *Kitchen and swill feeding*
- *Free ranging*
- *Population size often unknown*
- *In specific areas 50-90% of the whole pig population*



Wild boar cycle

- The virus is maintained by the wild boar independently from the infection in domestic pigs and ticks*
- Wild boar contaminate the environment making more likely outbreaks in domestic pigs (both non commercial and commercial)*
- Where the wild boar is the reservoir, almost all of the domestic pigs outbreaks are determined by direct/indirect contact with wild boar*

ASF virus prevalence and sero-prevalence in wild boar

- ❖ Found dead animals: **70-95% virus positive**
- ❖ Virus prevalence in hunted animals: **1-2%**
(**0,05-5%**)
- ❖ Antibodies prevalence in hunted animals: **0-2%**

The virus naturally spreads 30-60 km/years

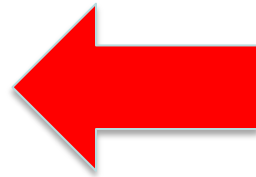
ASF VIRUS IS VERY STABLE

Wild boar carcasses: 3 – 5 weeks infectious

- **Stable in carcasses (dead animals) which decompose**
- **What does it mean?**
- **An infected wild boar carcass can maintain alive the virus for months during winter**
- **The forest is infected even in the absence (or very low density) of wild boars;**
- **In winter the virus easily survives till next summer when the cycle initiates again when new born wild boar or moving wild boar arrive in the infected forest**



Virus survival
in carcasses
(winter)

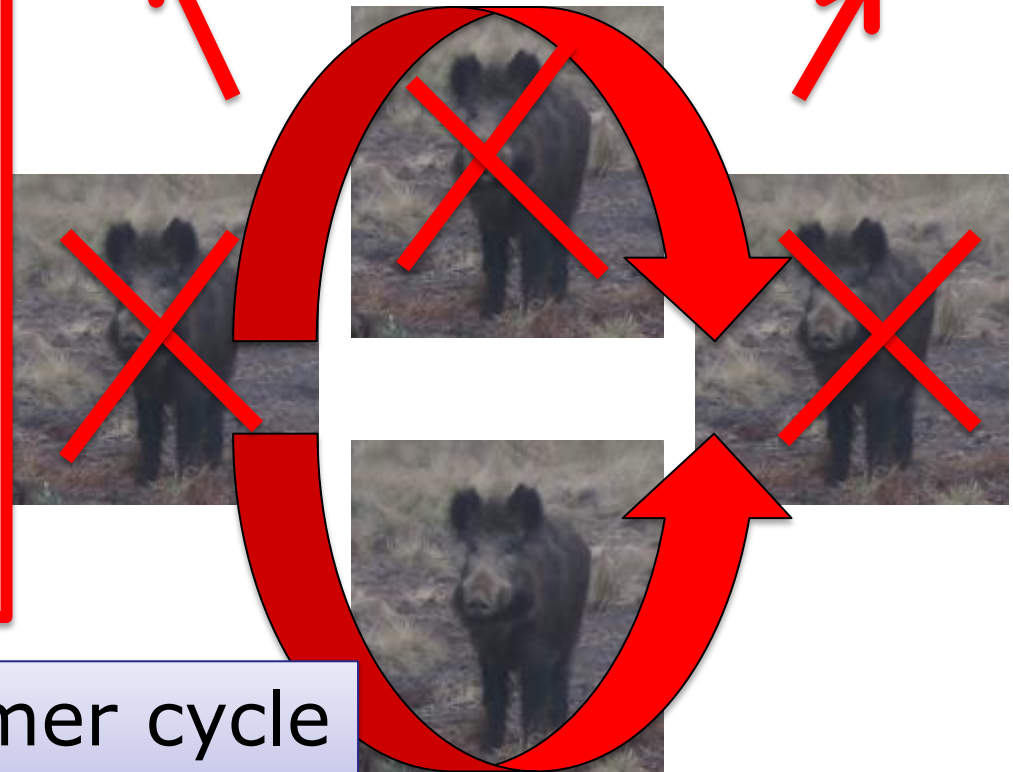


Spring-summer cycle
(direct contacts mainly)



Virus survival in carcasses (winter)

Despite very few wild boar still alive, the virus survives in carcasses and thus available for the next breeding season. When new born or neighbouring animals will be infected and a new cycle will initiate.



Spring-summer cycle
direct contact mainly

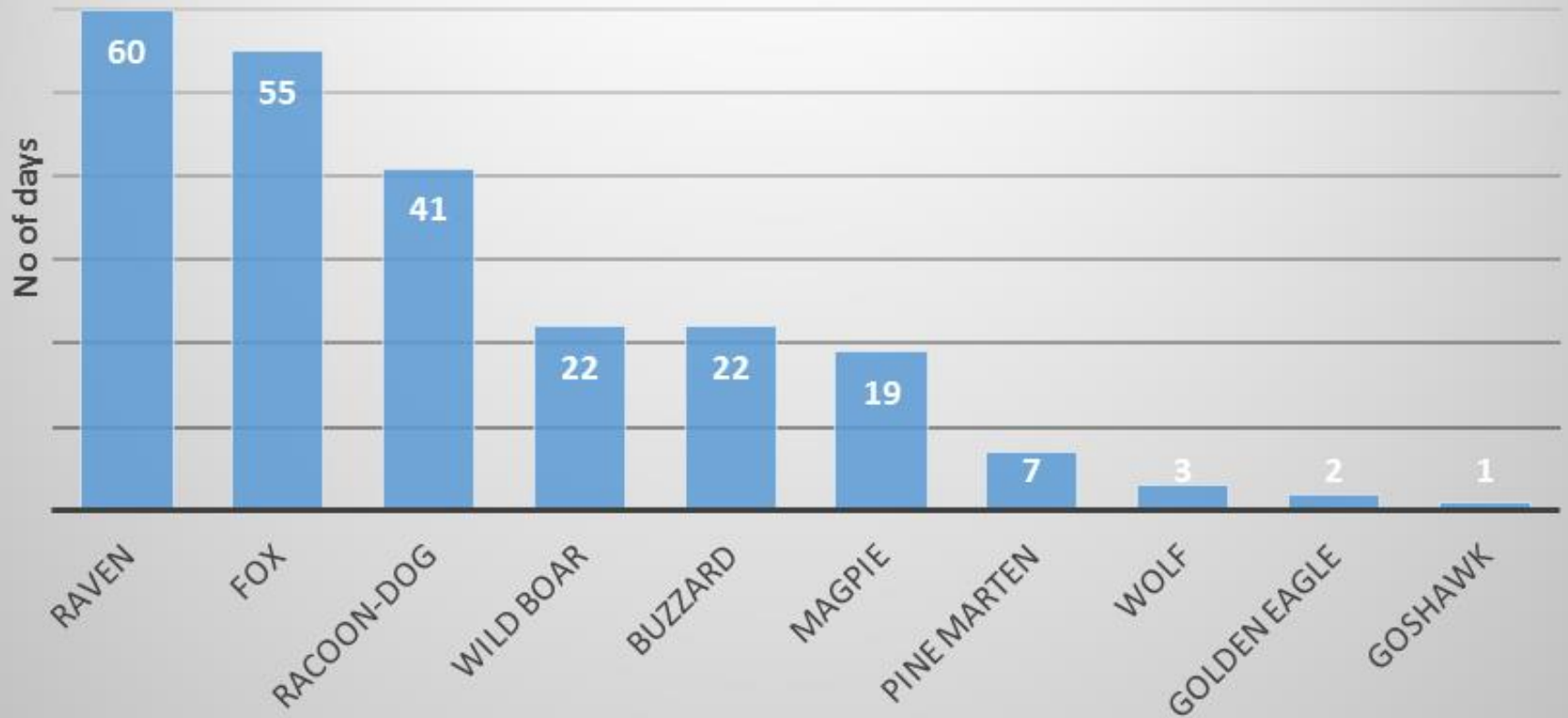


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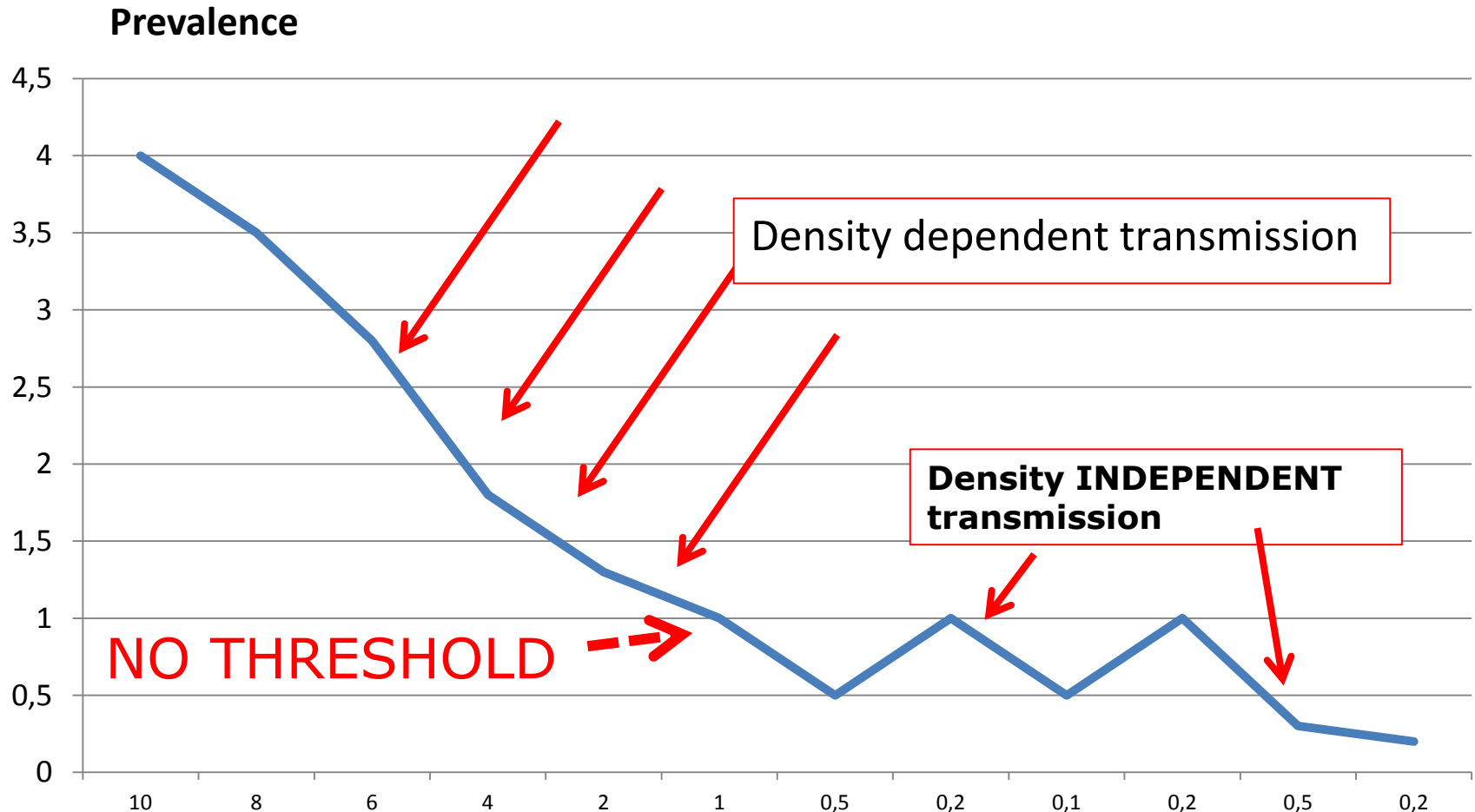
Consumers of wild boar remains



ASF in wild boar

- ◆ *A mixed transmission: direct (wild boar to wild boar) and indirect (infected carcass to alive wild boar)*
- ◆ A density dependent transmission during late spring summer early autumn (new born and adult animals)
- ◆ A virus survival during winter in wild boar infected carcasses
- ◆ The virus is still present in the environment despite a very low wild boar density => **NO THRESHOLD**

ASF is not a truly density dependent infection.
The ultimate persistence of the virus is guaranteed
by carcasses



Practically

ASF in wild boar eradication is **PROBABILISTIC EVENT** (stochastic) NOT a DETERMINISTIC one;

Eradication **probability** increases when: **wild boar population** size is **reduced** (as much as possible); **carcasses** are safely **disposed** (as much as possible);

OIE => Standing Group of Experts on African swine fever in the Baltic and Eastern Europe region under the GF-TADs umbrella

SGE ASF3: Moscow, Russia, 15-16 March 2016

Wild boar population reduction should be considered, in combination with other control measures, within the framework of a wild boar management strategy aimed at reducing ASF virus contamination of the environment

A real challenge for any Veterinary Service

Take at home message

1. **Two different**, even if connected, **ASF cycles** are present in Europe: *the back yard cycle and wild boar cycle*
2. *Back yard pigs and low biosecurity farms are at high risk*
3. *The presence of infected wild boar populations increases the probability of virus introduction in domestic pigs*
4. Due to the **high environmental resistance** of the virus, *infected areas are likely to remain infected for long time*
5. The likelihood of **long distance transport of the virus by humans** increases proportionally to the size of the *infected areas*
6. *In wild boar the safe **removal of infected carcasses** plays a pivotal role in ASF control*



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