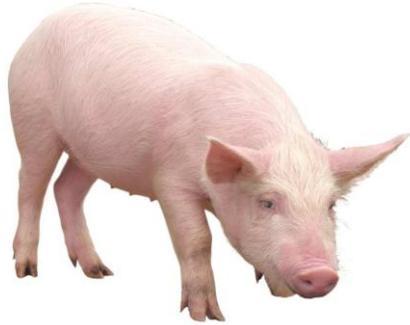
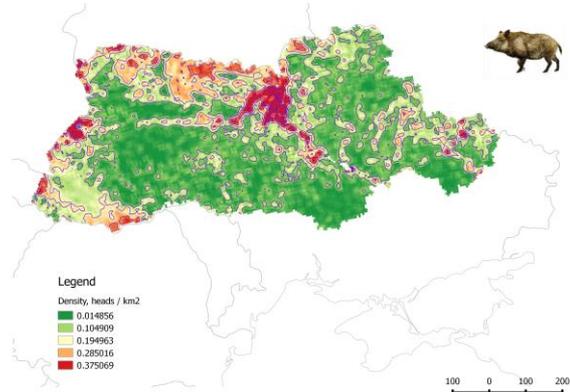
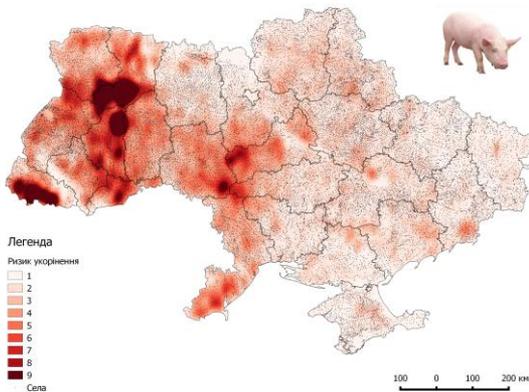


The interface between wild boar and extensive pig production:

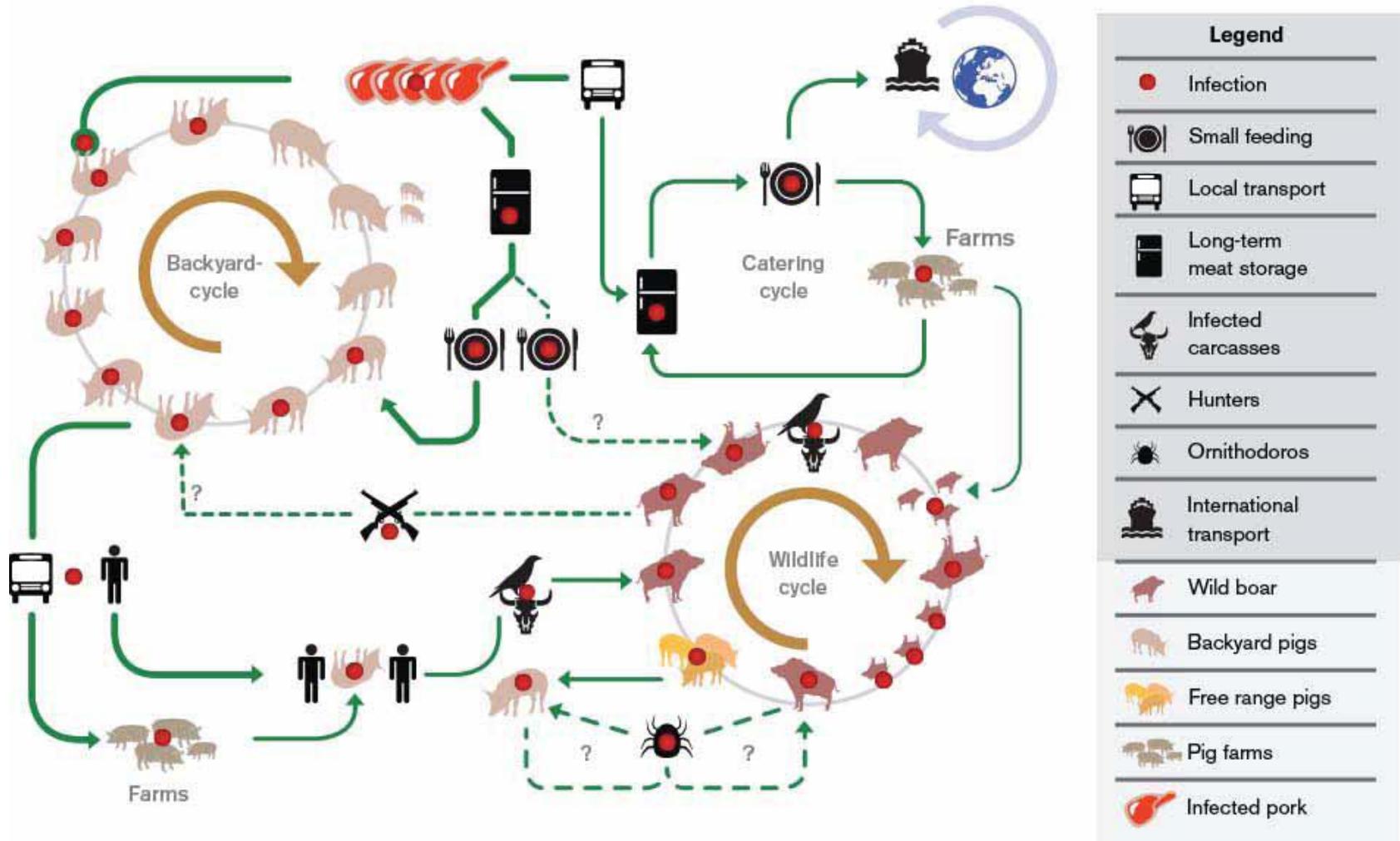
implications for the spread of ASF in Eastern Europe



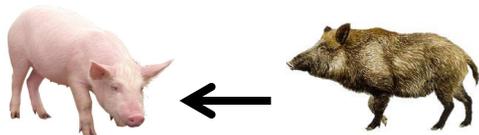
Sergei Khomenko, PhD
Disease ecology & wildlife
Specialist, FAO HQ



Epidemiological cycle of ASF in Eastern Europe



ASF transmission at the interface



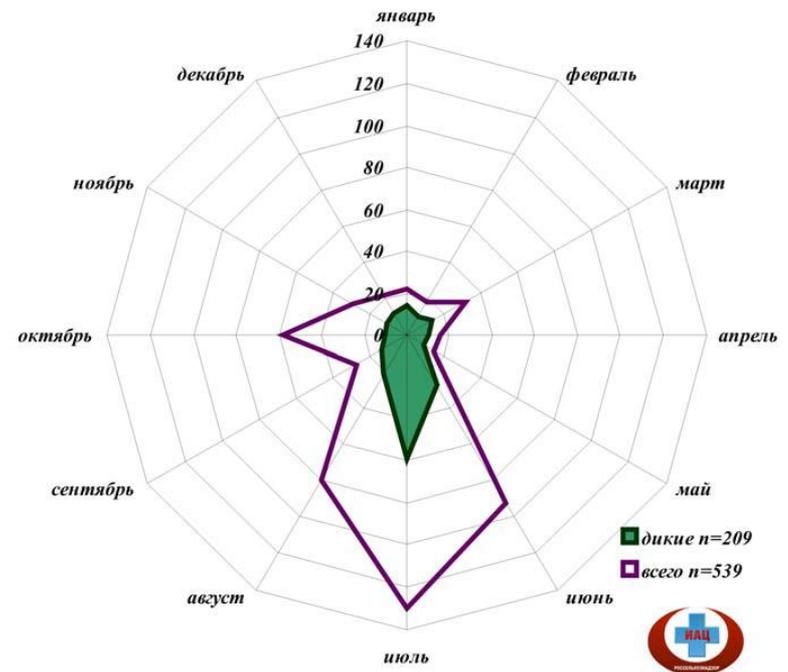
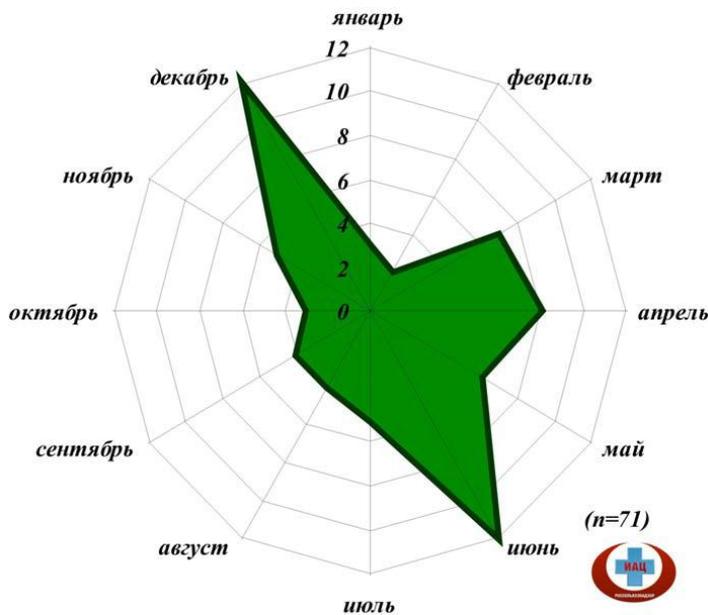
- **Disposal of contaminated carcasses** and products scavenged upon by wild boar (*very common*);
- **Direct contacts between domestic and wild pigs** where free range pig breeding exists (*rare and localized*);
- **Environmental contamination and mechanical transmission** with feed & other livestock species sharing habitats with wildlife or humans attending wild boar habitats (*moderately common*);
- **Hunting wild boar** (always highly selective towards sick animals !) and delivery of contaminated carcasses to the households (*occurs increasingly more often*)

A shift in the seasonality of ASF in wild boar after 2010 towards summer

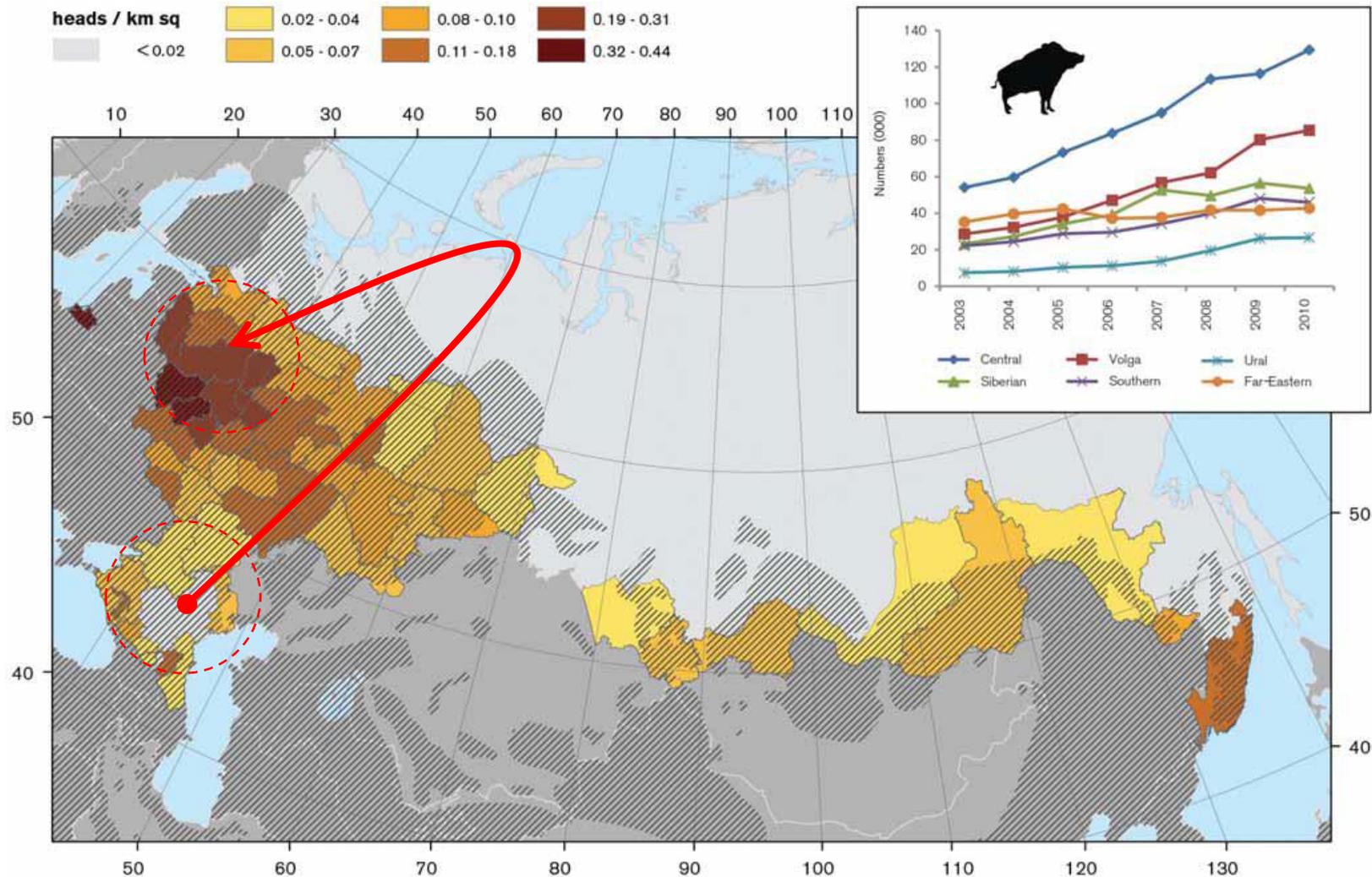
Bimodal in
2007-2010



Single peak
after 2010



In 2012-2014 ASF has shifted to a much higher density area in the RF



Spread of ASF in EE SUMMARY

СПАЛАХИ СЕРЕД ДИКИХ КАБАНІВ

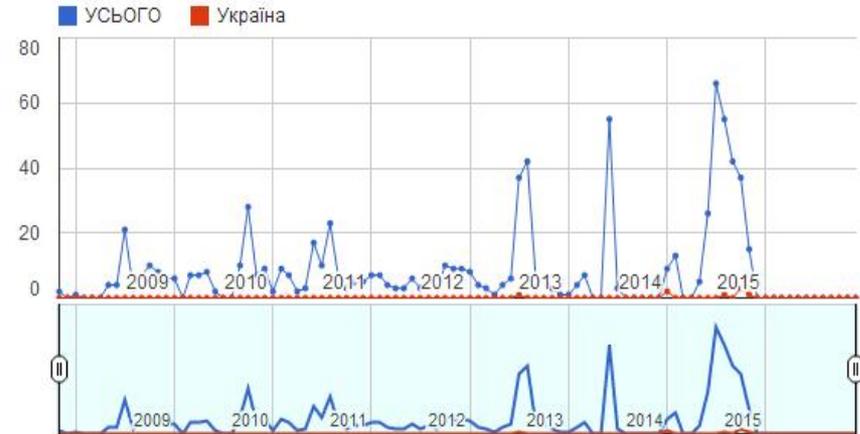


СПАЛАХИ СЕРЕД ДОМАШНІХ СВИНЕЙ



УСІ СПАЛАХИ АЧС 2007-2014

ASF monthly dynamics



All outbreak density, 2007-2014

ГУСТОТА УСІХ СПАЛАХІВ





Average density in the affected countries

Contributors: Sergei Khomenko*, Daniel Baldiri-Alcarrudo*, Andriy Rozstalnyy*, Andrey Gogin*, Denis Kolbasov*, Julio Pinto*, Juan Lubroth*, Vincent Martin*
 * Food and Agriculture Organization of the United Nations (FAO)
 * All-Russian Scientific Research Institute of Veterinary Virology and Microbiology (Pokrov, Russian Federation)



2012

In countries where the density of wild boar is higher than in the Russian Federation, i.e. Belarus, Estonia, Latvia, Lithuania and Ukraine (Table 1 and Fig. 7), the epidemiological role of wild boar may differ from what has been observed so far in the Russian Federation. A higher involvement of wild boar in the transmission cycle can be expected, and perhaps even a continuous (year-round) transmission cycle. Although wild boar comprise only 1.9 percent of the susceptible population in the region at risk (Table 1), their wild and free-living nature makes prevention and control in those populations particularly challenging.



Country	heads/km ²
Russia	0.08
Ukraine	0.11
Belarus	0.28
Estonia	0.51
Poland	0.73
Lithuania	0.84
Latvia	1.04

What is population density ?

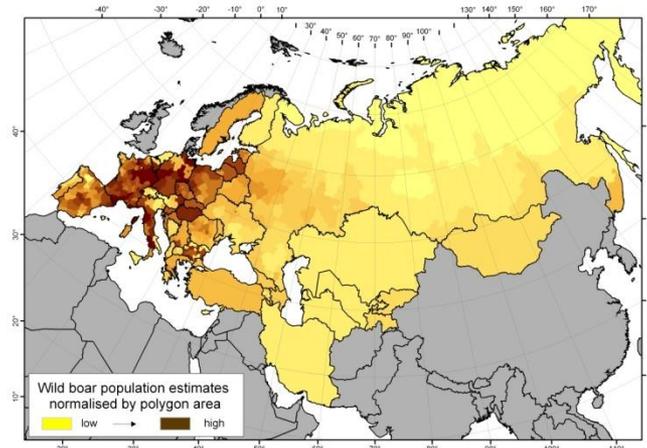
1. At country level – just a convenient standardized way to compare relative abundance;
2. At province / district level – compare relative abundance at sub-national level;
3. Real population density (epidemiologically relevant) is **the number of animals per unit area of suitable habitats.**

3 – is very variable in time and space and difficult to measure in a consistent and comparable way between locations

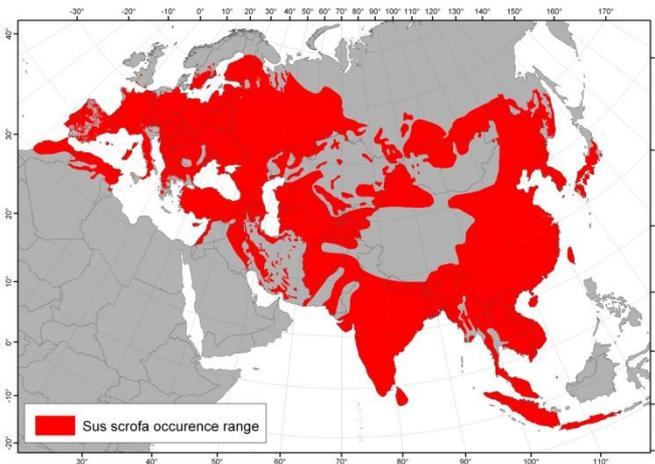
Wild boar population modeling in the N Eurasia

Population and/or harvest data (2005-2010) on **504 spatial objects** in 48 countries

3,600,000 – post harvest
2-2,500,000 - harvested



+ Clipped



Resultant polygons were used to re-calculate average density of wild boar (particularly at the edges of its distribution range)

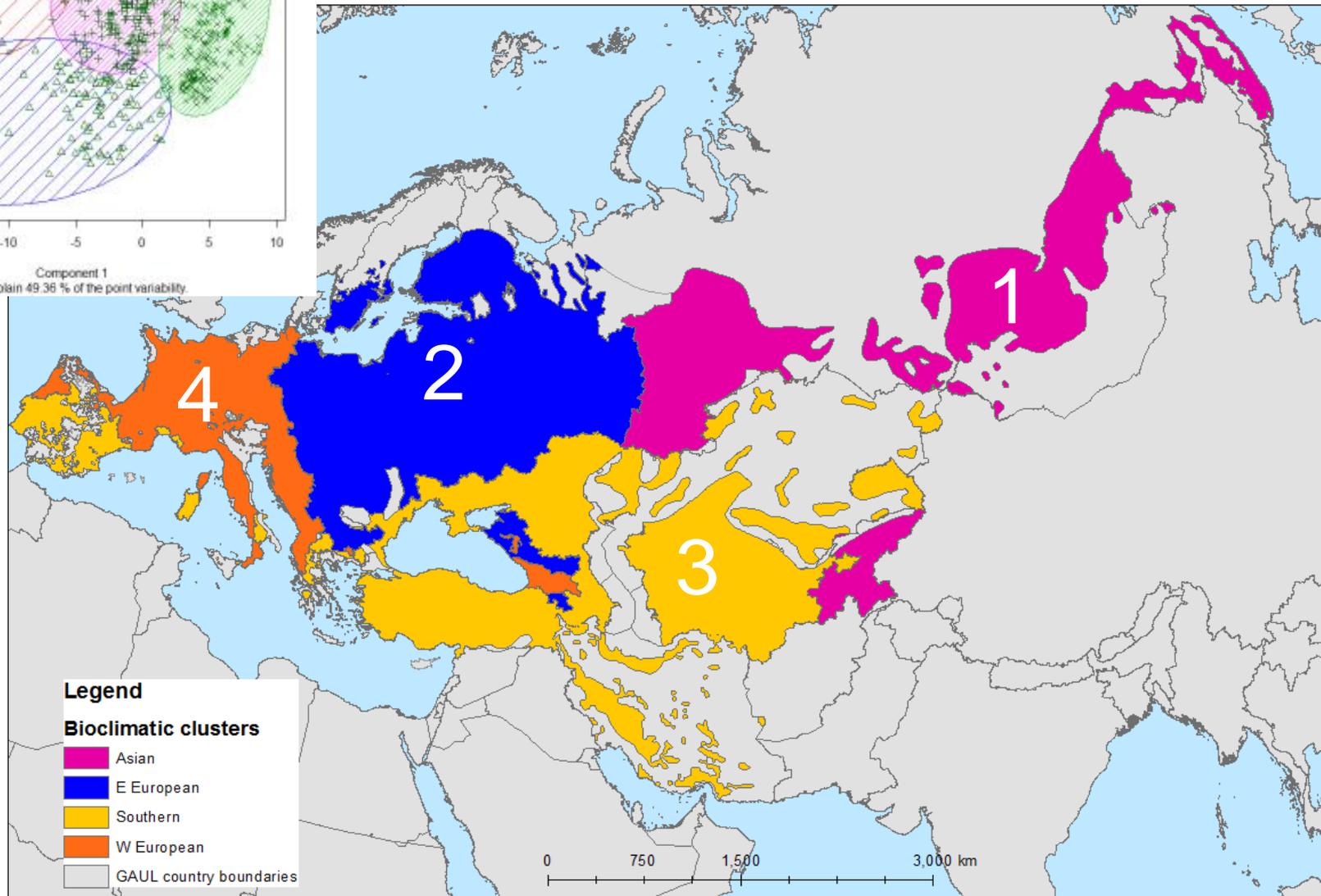
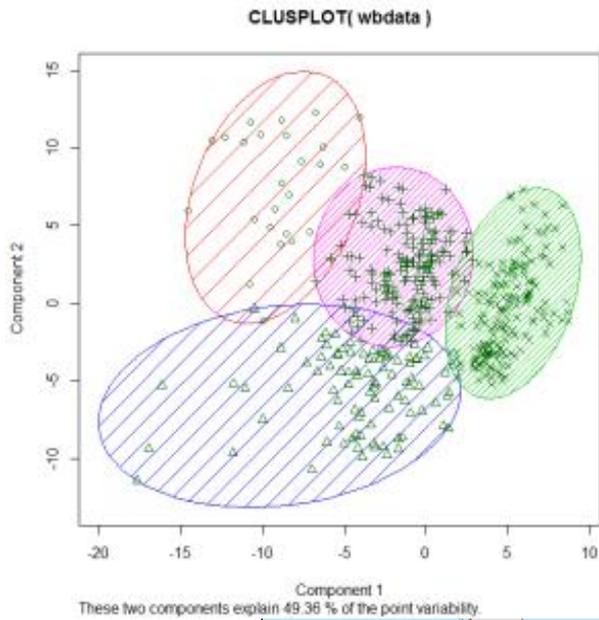
=

Zero population and 3 outliers with extremely high population density were removed from the dataset

Tasks, approaches and expected geospatial products

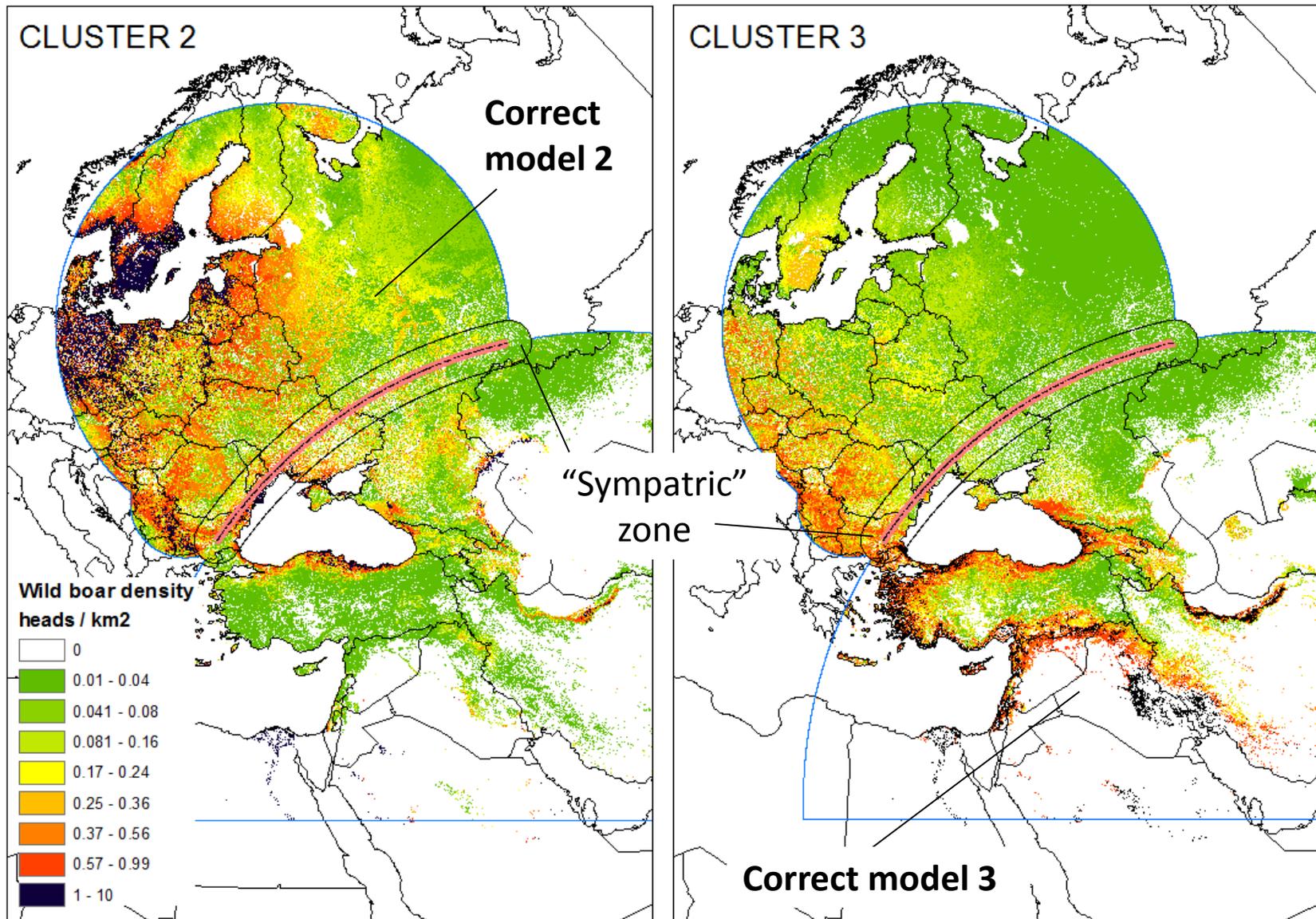
1. A niche-based deterministic modeling **to identify predictors** explaining pattern(s) of wild boar distribution and population density;
2. Developing a geostatistical approach **to disaggregate wild boar population data** from admin units to 1 or 5 km resolution rasters based on the predictors;
3. Produce a set of **fine scale geospatial products** describing **patterns of suitability / distribution / population density of wild boar** on the scale of North Palearctic.

Results of wild boar range classification into 4 niches

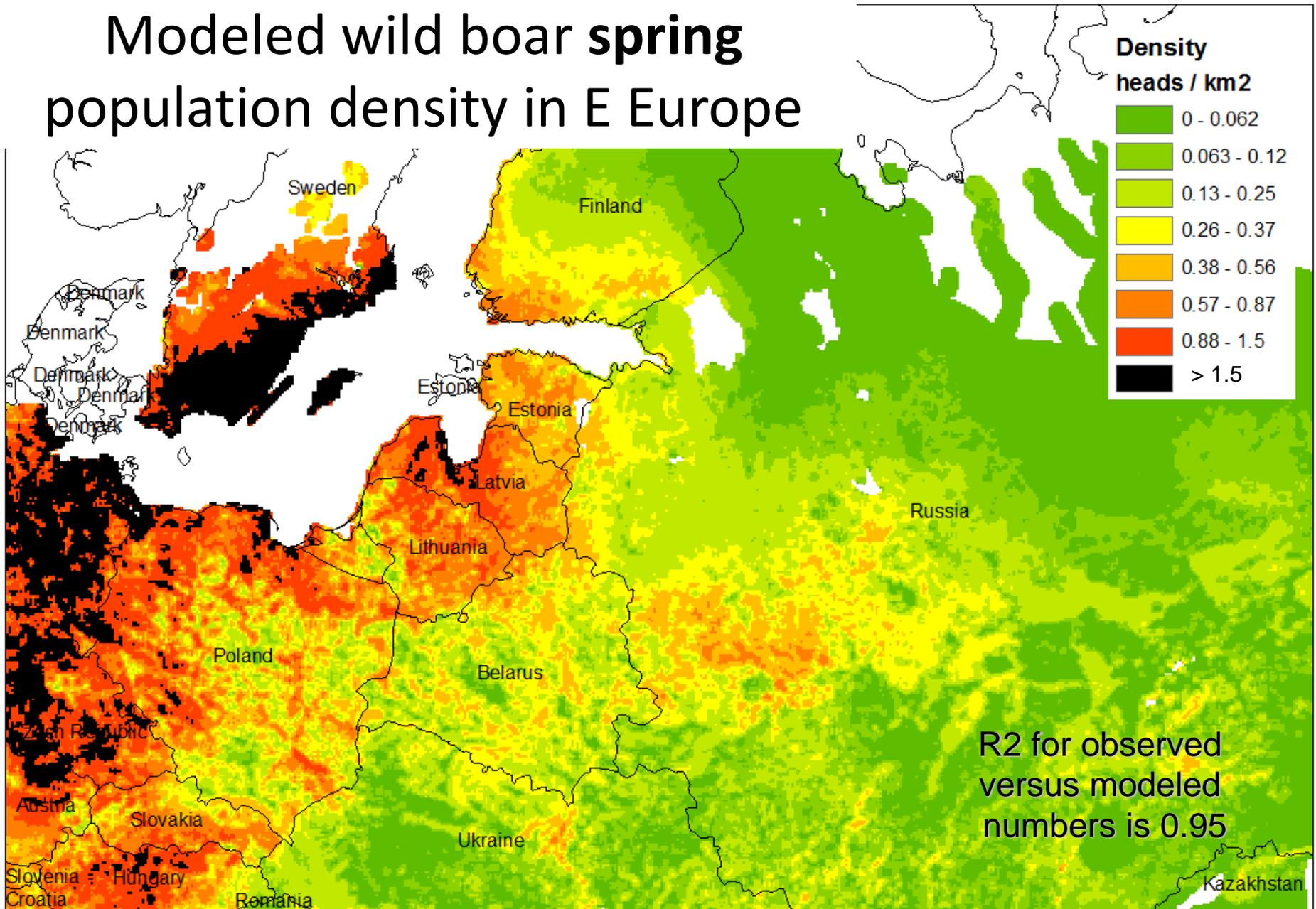


East European (2) & Southern (3) models :

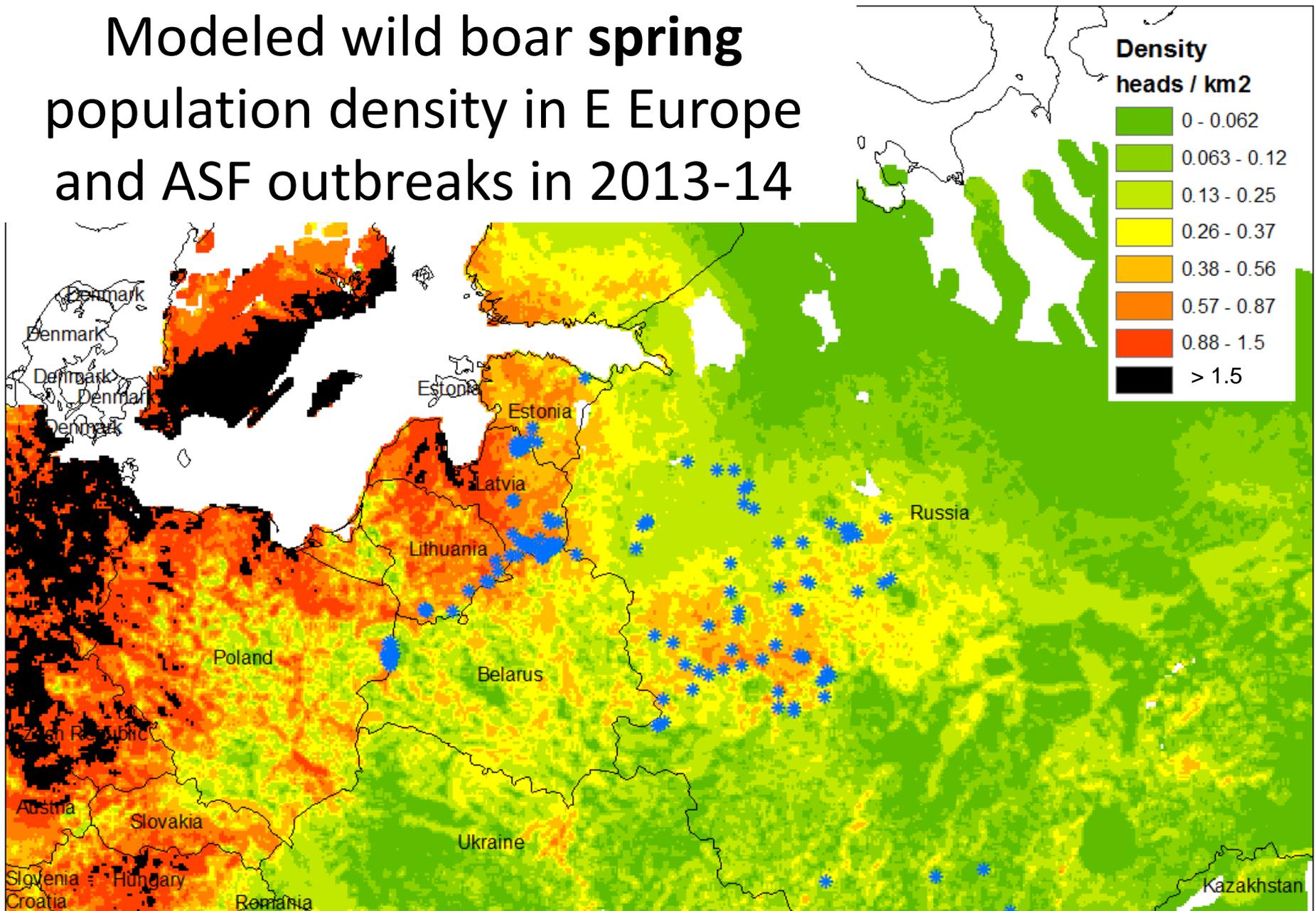
only trends without ATP kriging adjustment



Modeled wild boar spring population density in E Europe

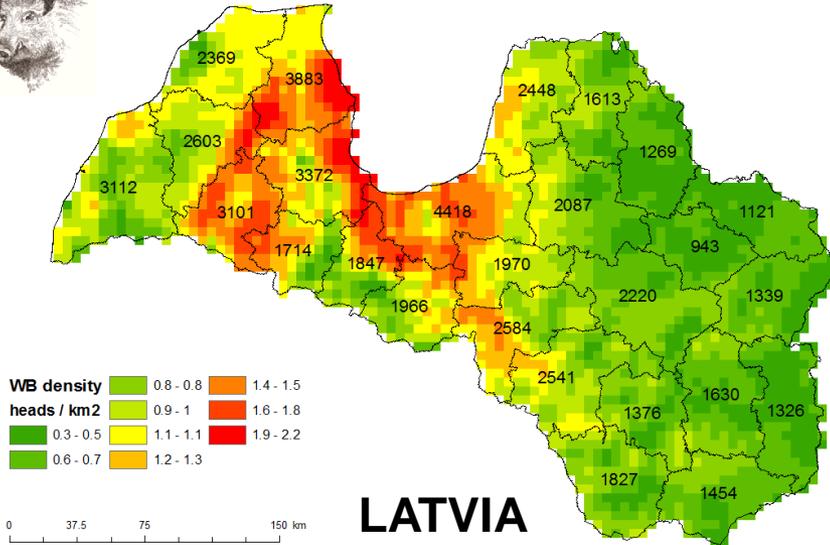


Modeled wild boar **spring** population density in E Europe and ASF outbreaks in 2013-14





Population density and size maps



Note that scales are different:

Latvia

0.3 – 2.2 heads / km²

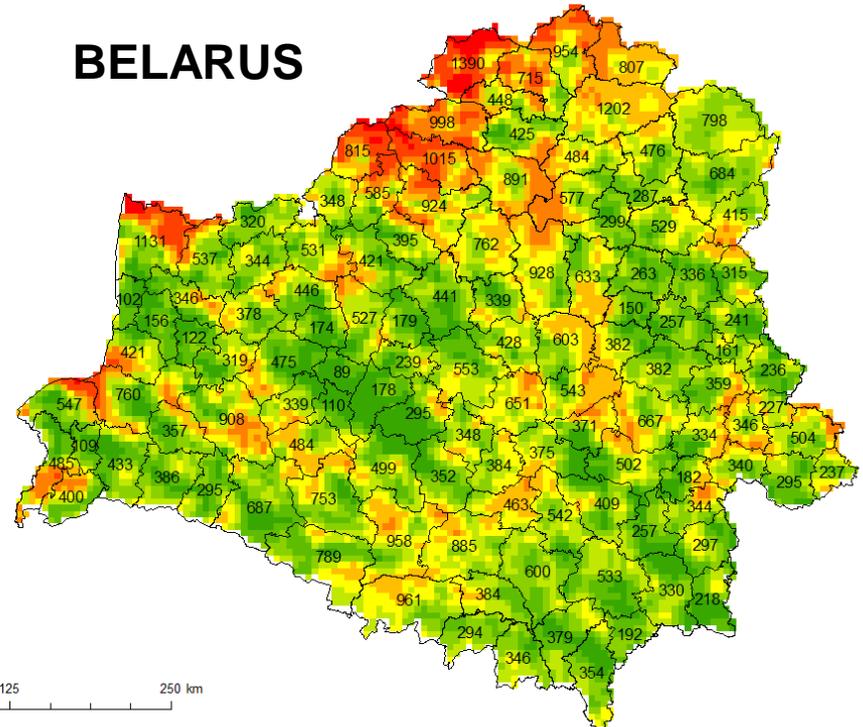
Belarus

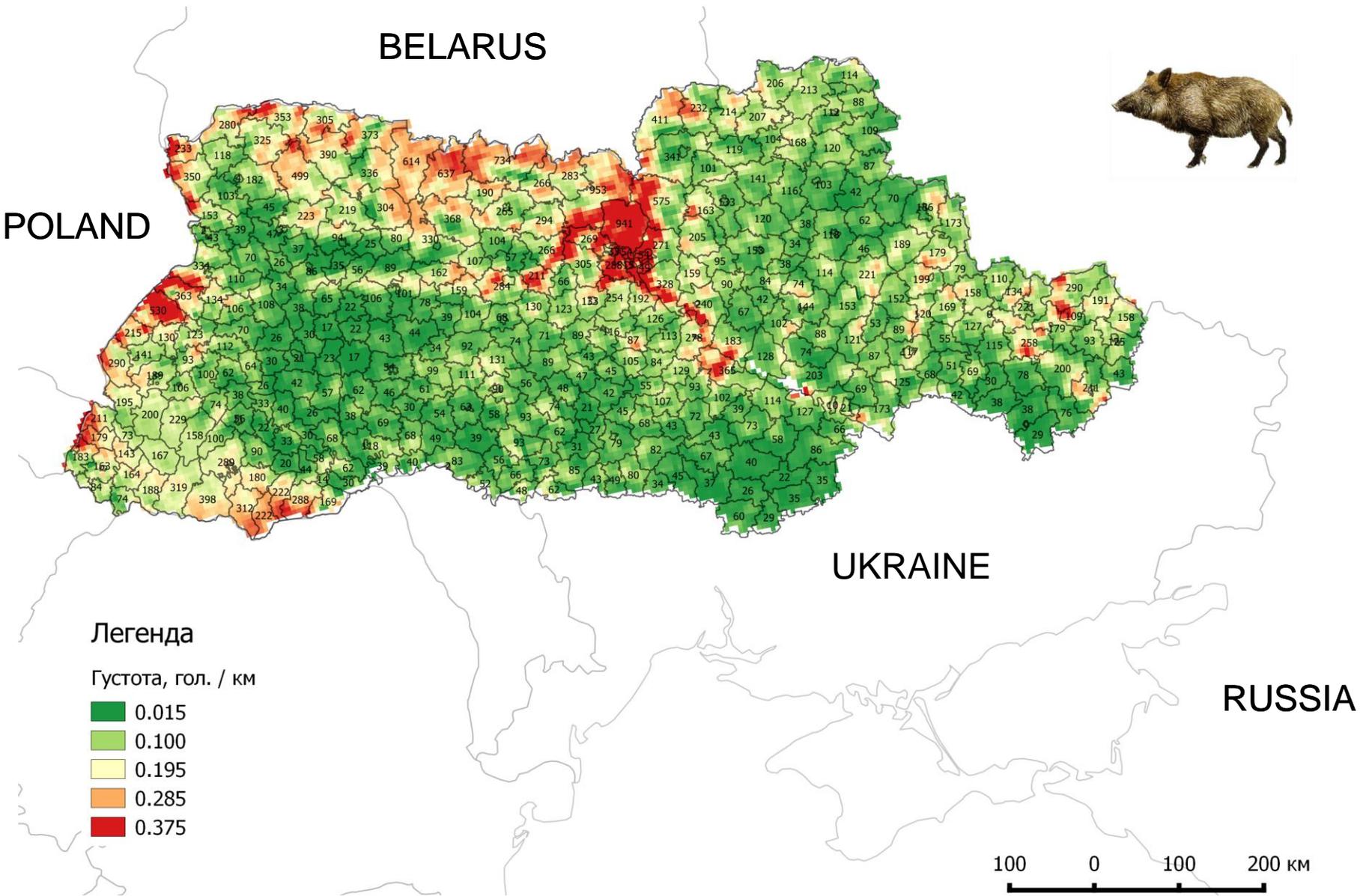
0 – 0.9 heads / km²

WB density heads / km²

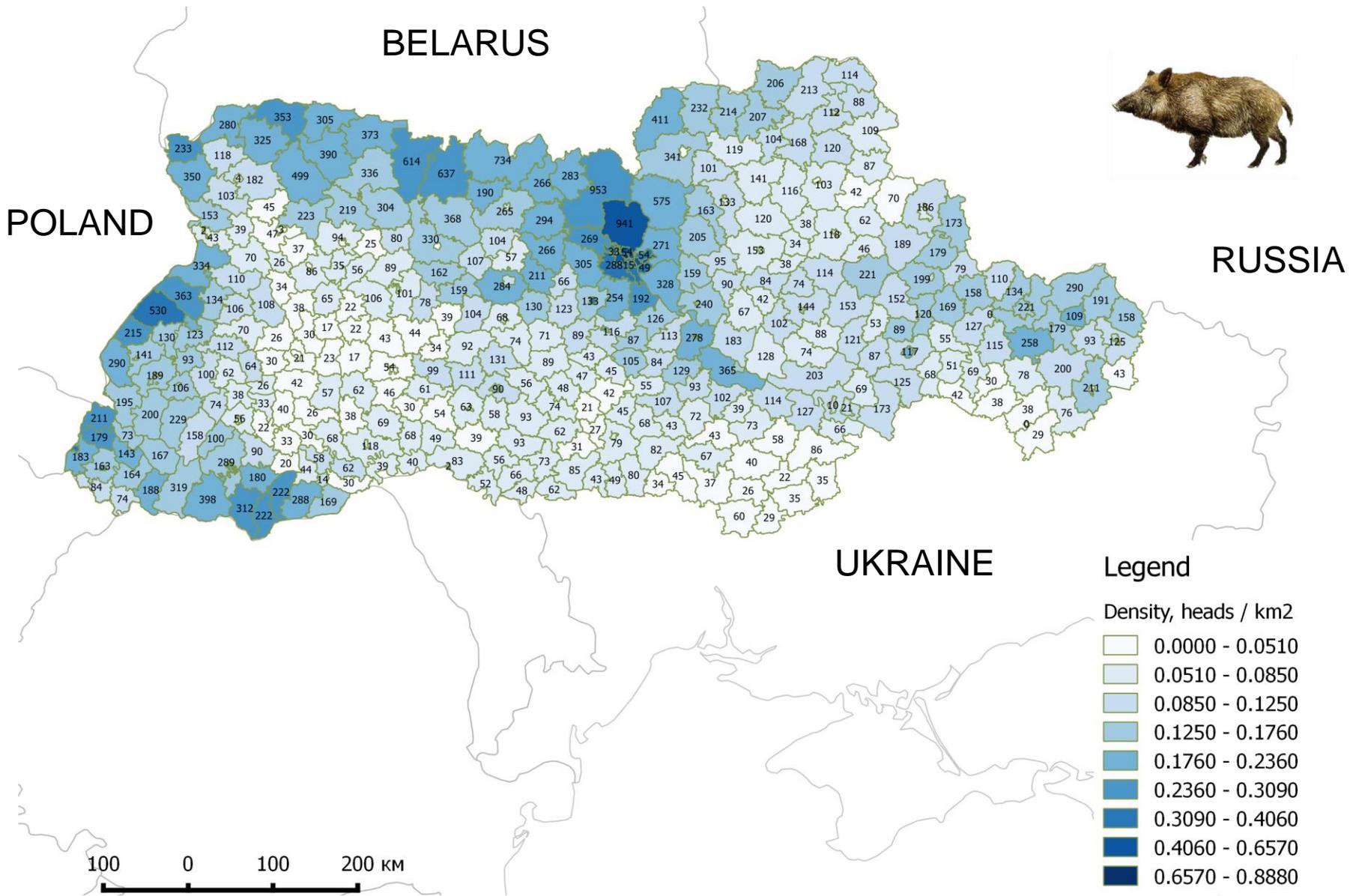


BELARUS



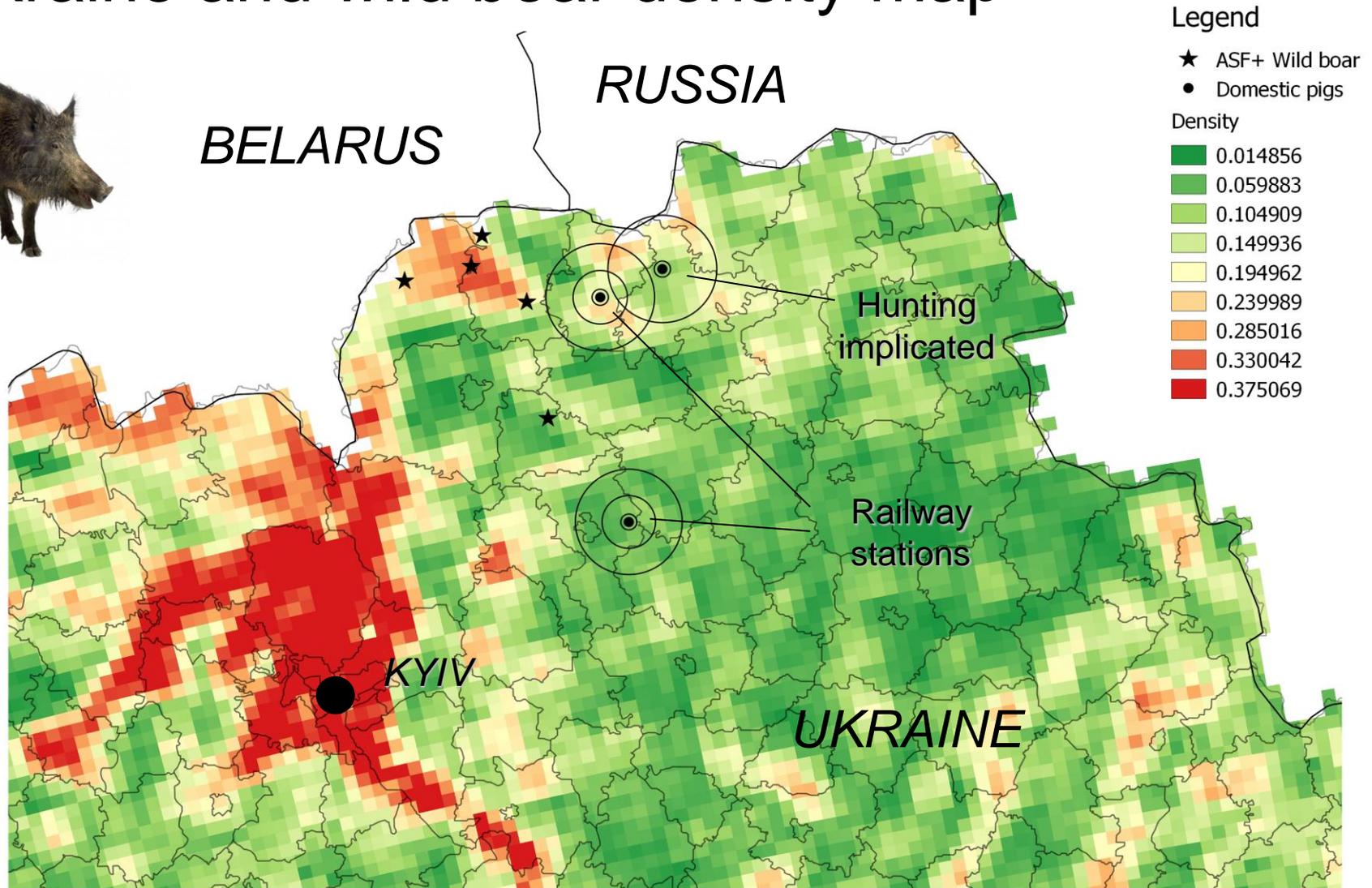


Population density at 5 km resolution and estimates by districts

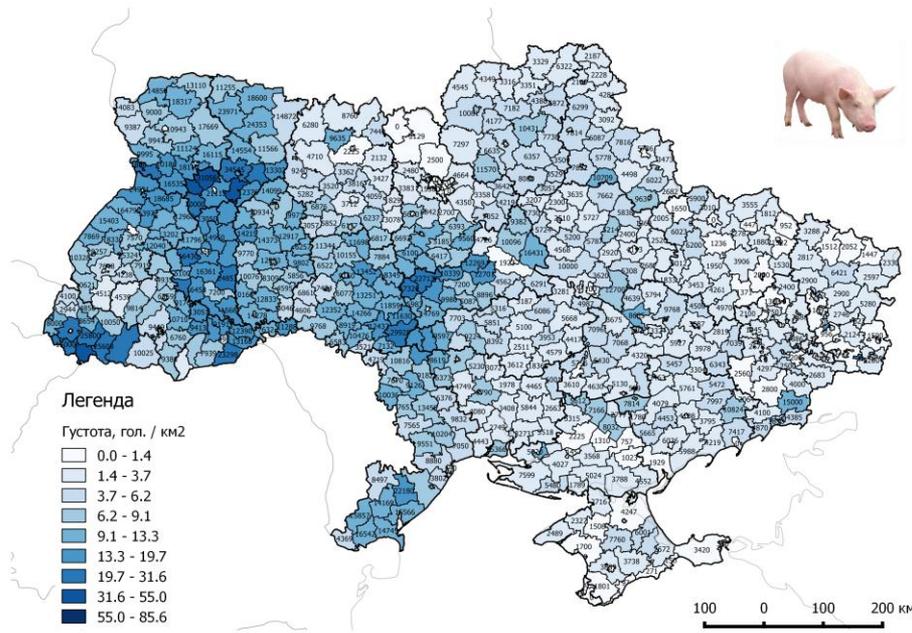


Population density and estimates at district level

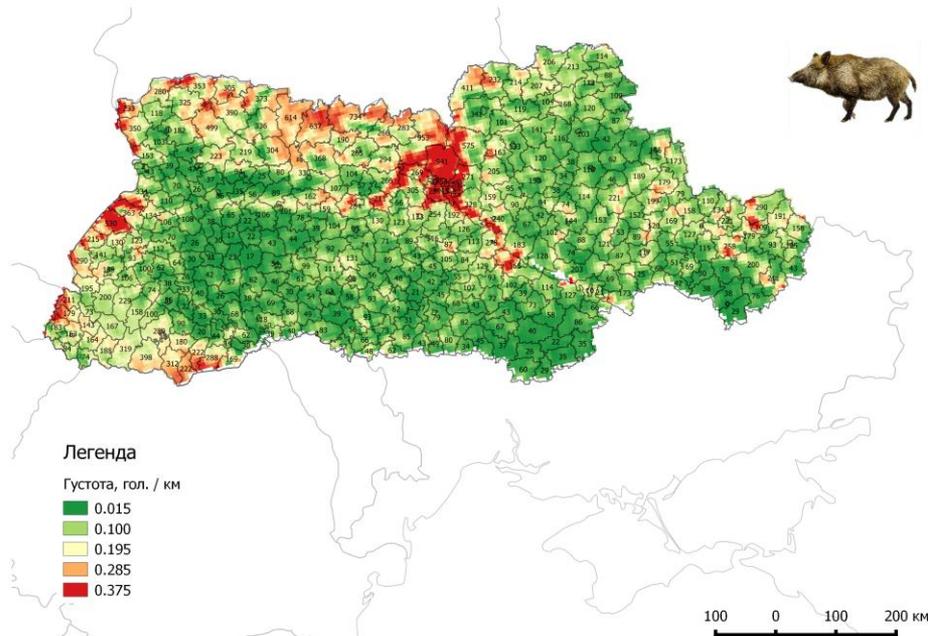
ASF in wild boar and domestic pigs in Ukraine and wild boar density map



Quantifying the interface

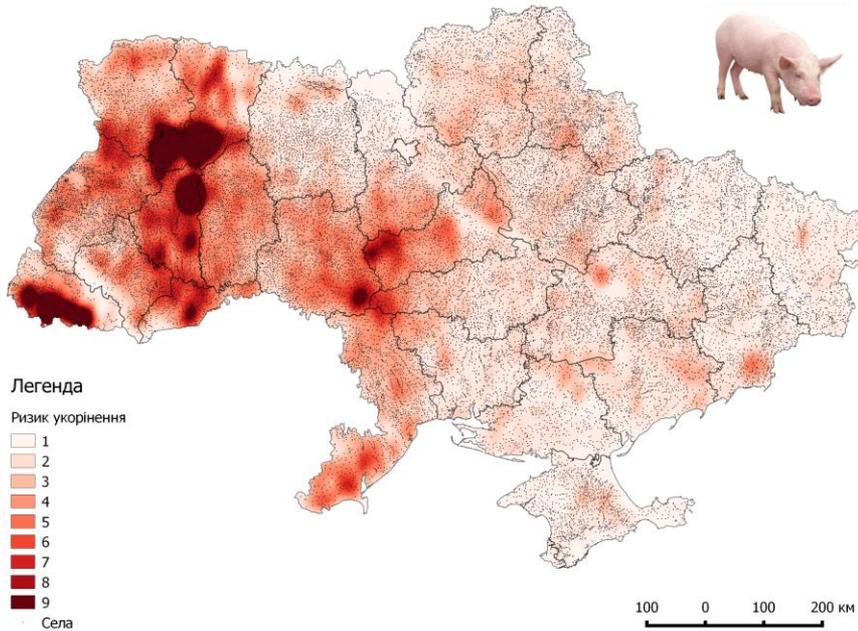


**< BACKYARD PIG
DENSITY (0 - 85)**

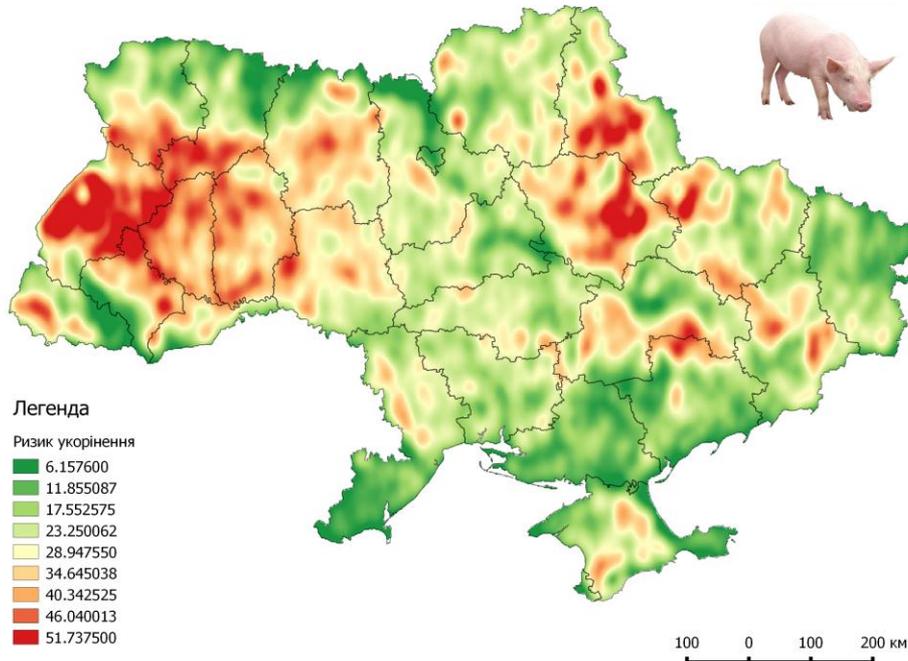


**< WILD BOAR
DENSITY (0 - 0.4)**

Fine scale backyard pig population mapping



< INTERPOLATED
BACKYARD PIG
DENSITY



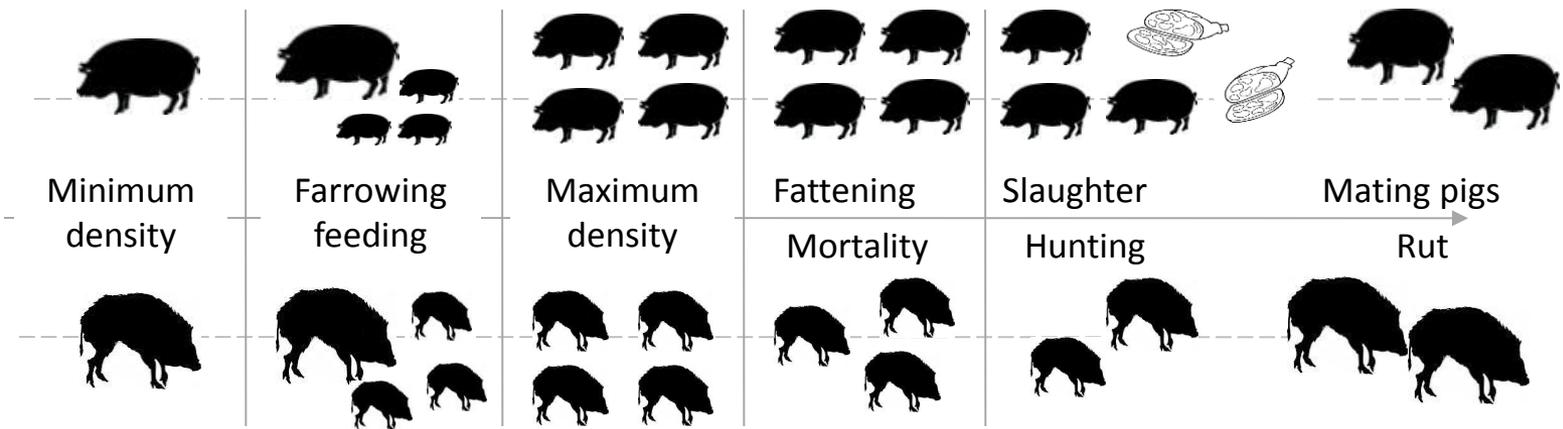
< INTERPOLATED
EPIUNIT (VILLAGE)
DENSITY



Applications of the suitability / population density maps

- 🐾 Population (or sample sizes) estimates for prevalence surveys or management interventions;
- 🐾 Risks of wild/domestic interactions, spillover events;
- 🐾 Population connectivity / fragmentation – simulated disease spread;
- 🐾 Disease modeling in combination with other spatial variables;
- 🐾 Retrospective epidemiological studies (e.g. in Russia and other ASF affected countries);

Phases of the life cycle

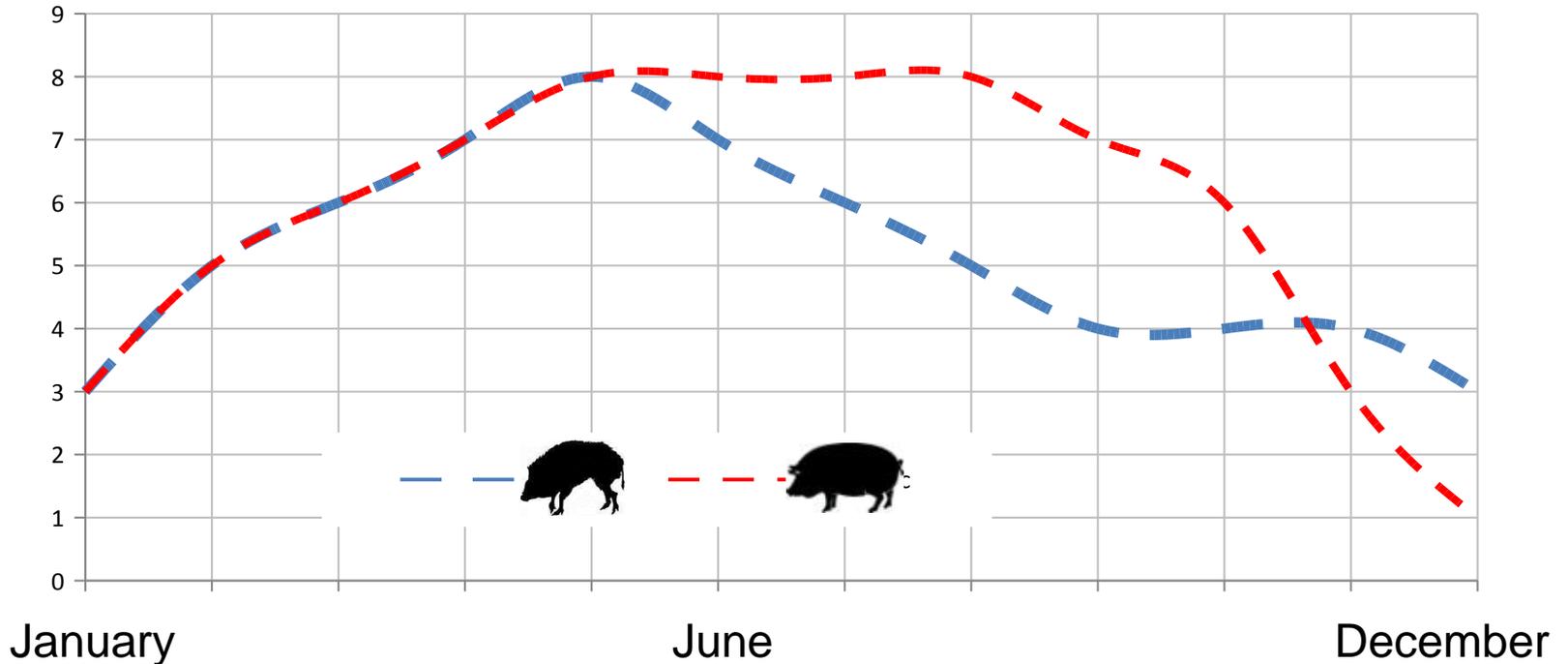


Spring census

+ (40-100 %)

- (30-50 %)

Relative population density



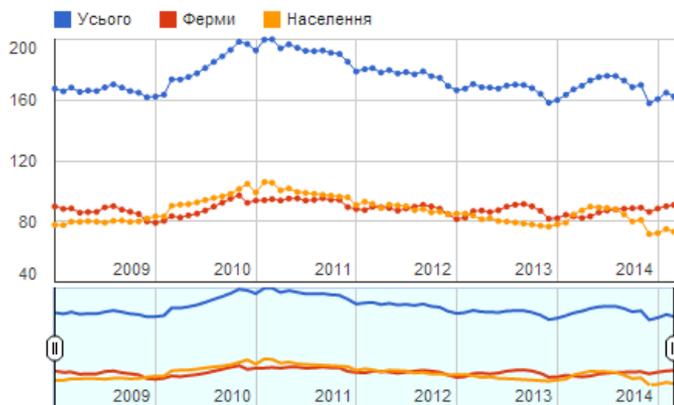
Seasonality patterns may strongly differ from area to area

ЗАКАРПАТСЬКА

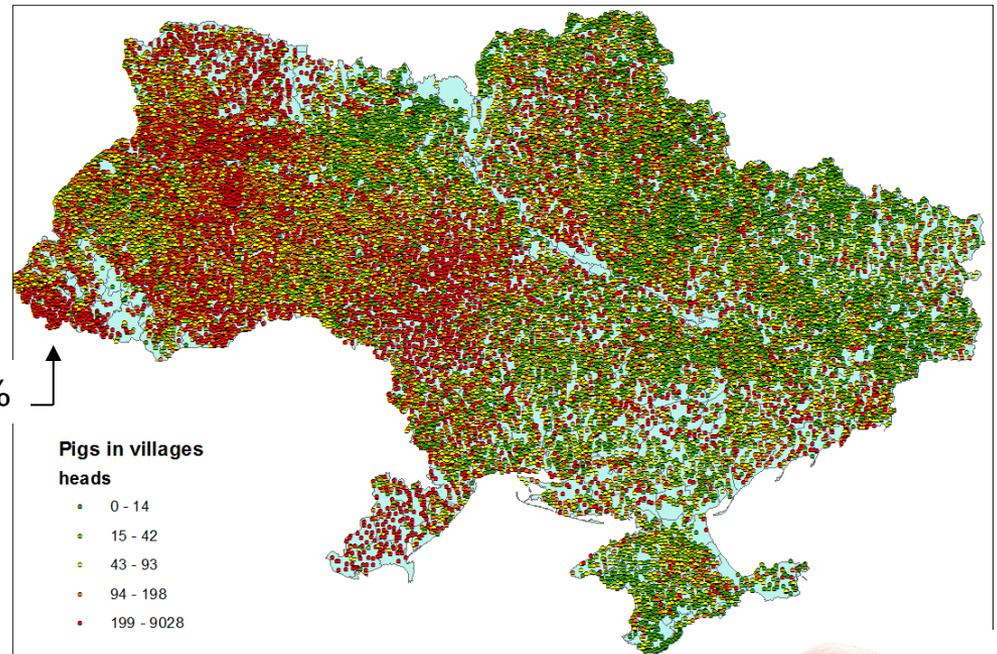
W Ukraine



ПОГОЛІВ'Я СВИНЕЙ В АР КРИМ (ТИС. ГОЛІВ)



NUMBER OF PIGS IN VILLAGES (n=29000)



40%

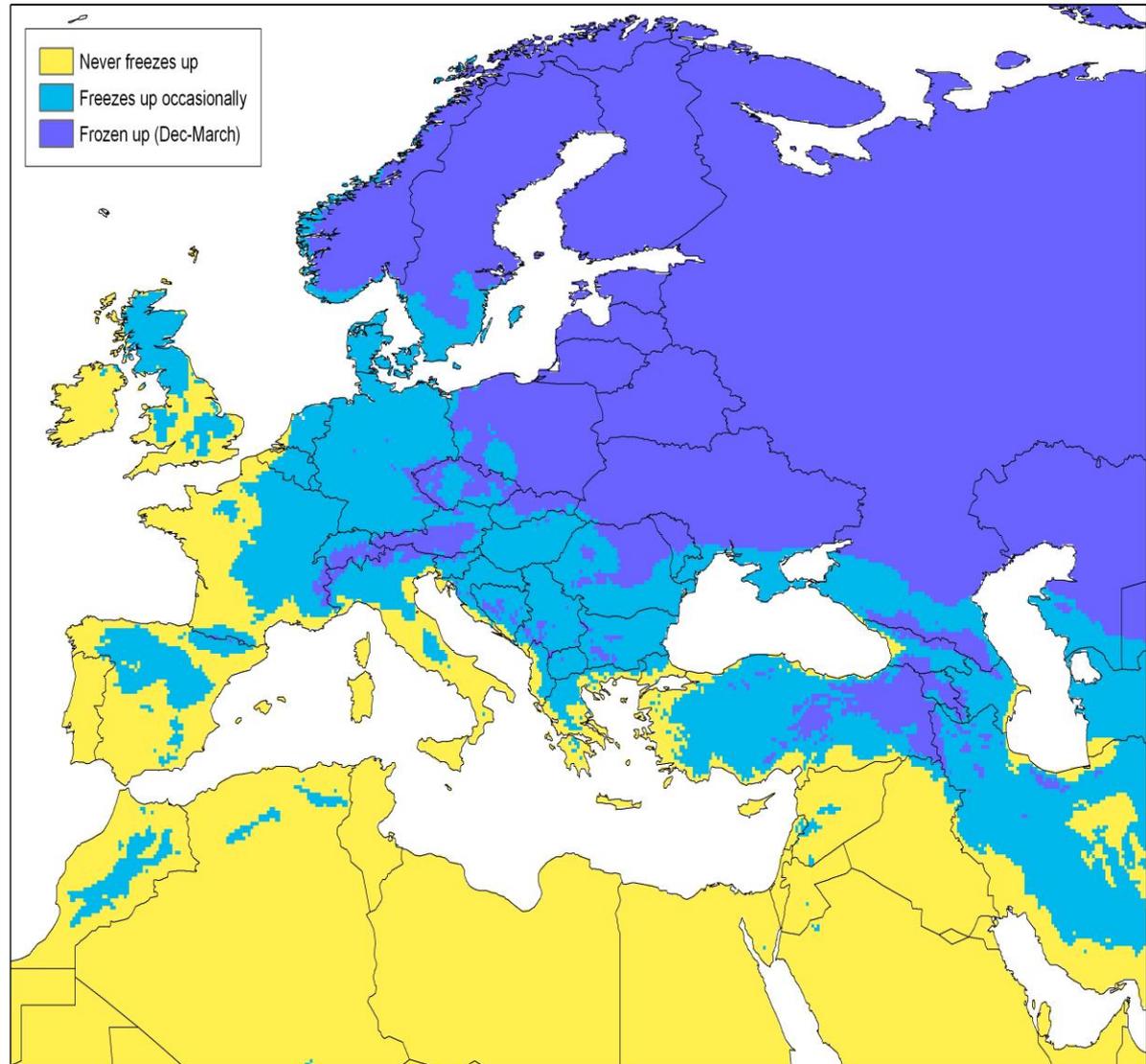


AR Crimea (no seasonality)

Environmental factors



Carcasses of domestic pigs and wild boar can survive for months frozen and snow covered and can re-initiate transmission cycle in spring



Understanding and managing ASF at the wild/domestic interface

- Currently wild boar / extensive pig production (backyard) are a UNIQUE epidemiological system with regards to maintaining and propagating ASF infection;
- Disease prevention / control should address BOTH sectors and anticipate a rather complex interplay of various risk factors that are changing in time and space;
- All the information / strategies / efforts have to be shared and harmonized across the affected (or at risk countries) and sectors (pig production & wildlife management or forestry) involved.



“STOP ASF” - Ukrainian online decision support GIS

▼ ELEMENTS OF THE SYSTEM:

EPIZOOTIC SITUATION
WITH ASF IN UKRAINE
AND NEIGHBORING
COUNTRIES

MODULE SUPPORT
FOR DECISION-MAKING

ACTION PLANNING
OBSERVATION

NOTIFICATION OF
SUSPICION OF ASF IN
UKRAINE

RISKS ENTRY ACHS IN
UKRAINE

RISKS SPREAD IN
UKRAINE

SCHEME SHARING
ONLINE VERSION OF
GIS

THE NUMBER AND
PLACEMENT OF STOCK

**GALLERY OF MAPS,
GRAPHS AND TABLES**

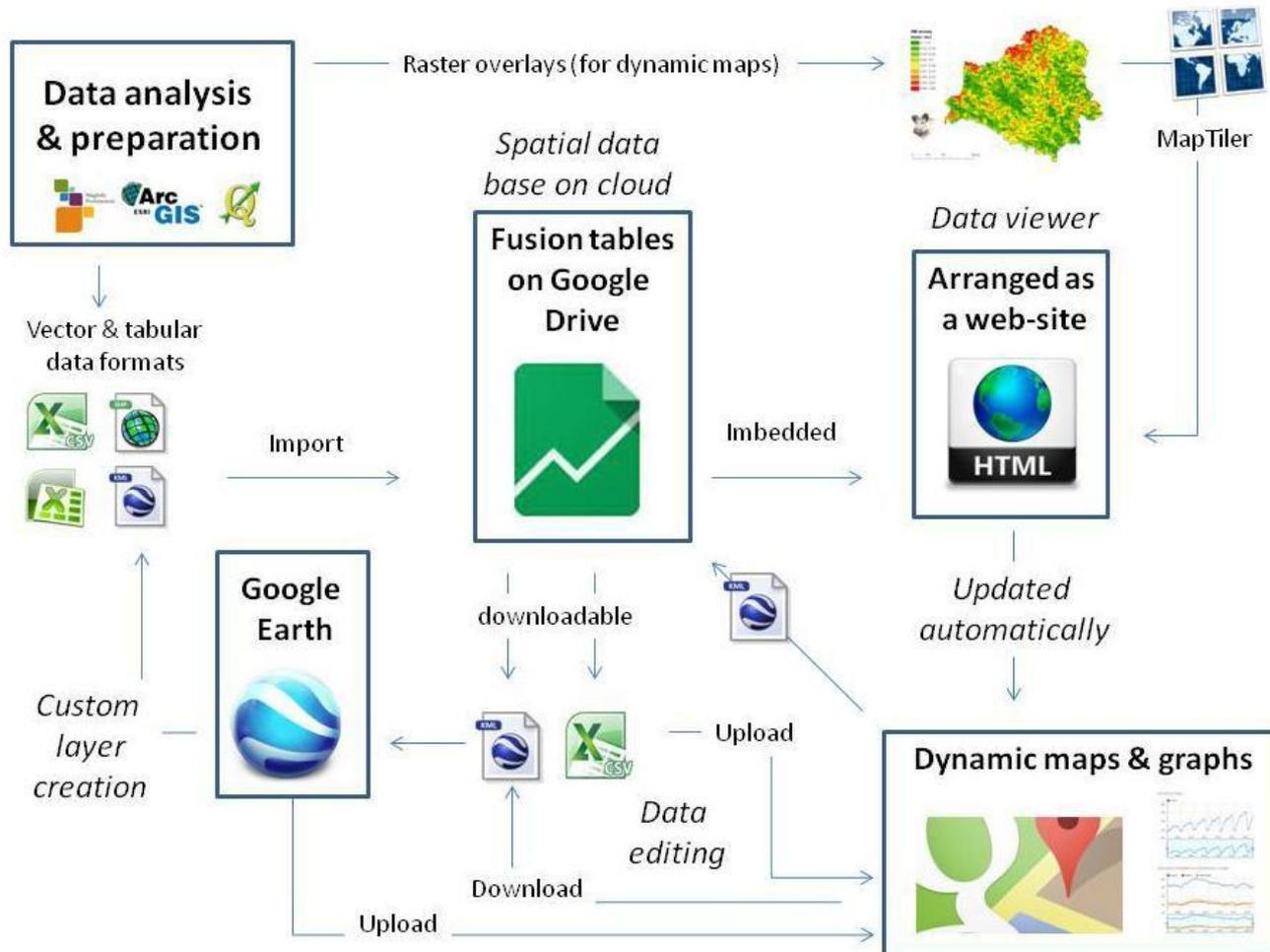
Elements of the system:

1. Description and User Help
2. The epidemiological situation with ASF in Ukraine and neighboring countries
3. The number and placement of pigs (4 levels)
4. The risks of entering the country ACHS
5. Risk factors common in Ukraine
6. Module support decisions on disease control
7. Module monitoring the disease of pigs
8. Notification of suspicion of ASF in Ukraine
9. Module update
10. Additional and reference materials (manuals, publications, etc.)
11. GIS data for battery life (based on the Program "Earth")

*Google translate
from Ukrainian !*

SUBPAGES (8): [EPIZOOTIC SITUATION WITH ASF IN UKRAINE AND NEIGHBORING COUNTRIES](#) [MODULE SUPPORT FOR DECISION-MAKING](#) [ACTIVITIES PLANNING OBSERVATION](#) [NOTICE SUSPICION OF ASF IN UKRAINE](#) [RISKS ENTRY ACHS IN](#)

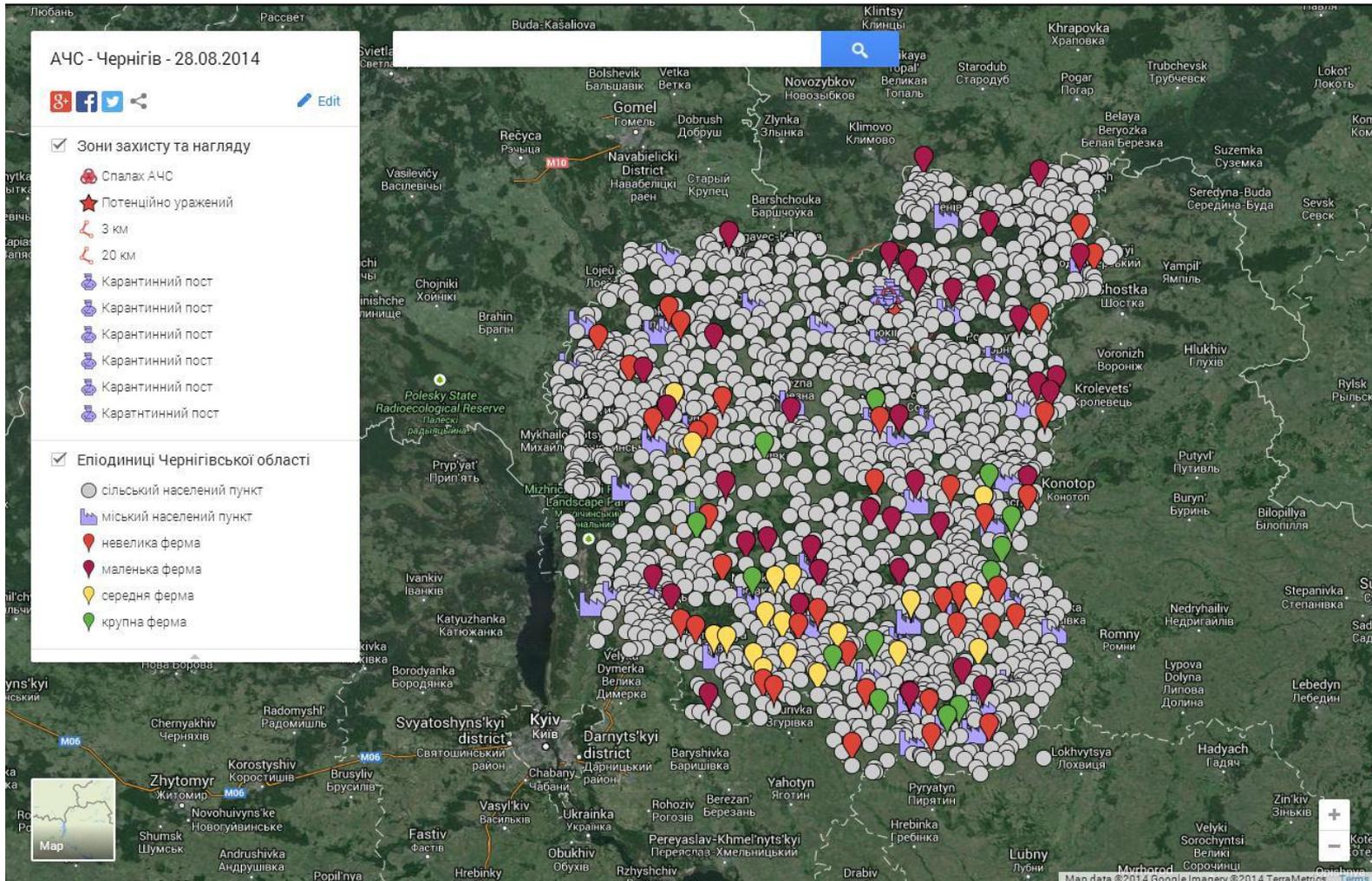
Simple Google services based decision support systems could be a good common information platform for all countries



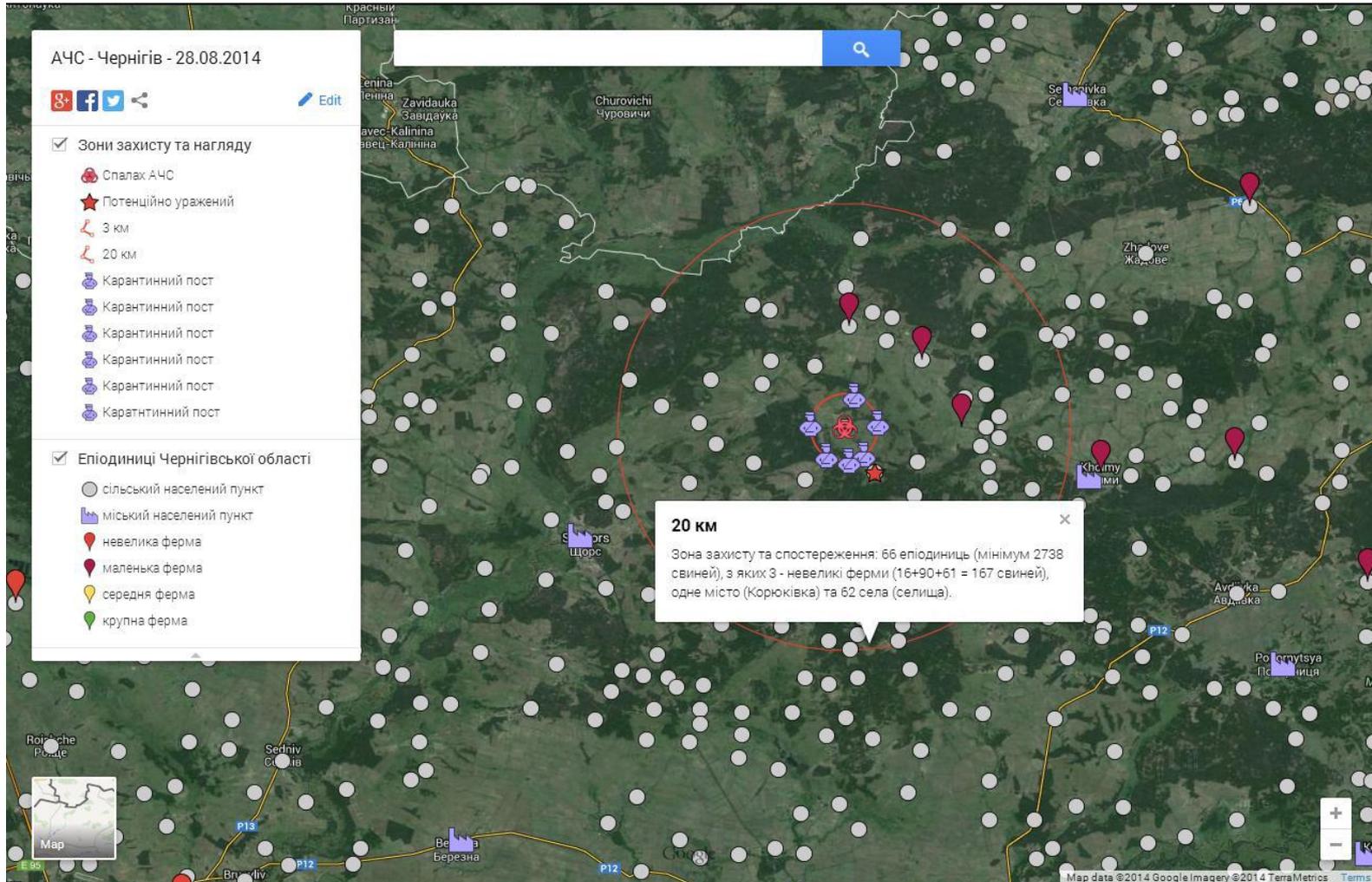
Advantages of dynamic online GIS:

1. **Cost effective** - does not require commercial software and expensive training of personnel.
2. **Expandable, updatable and easily customisable** to accommodate new information (including other species / diseases) in future.
3. **Adapted to collaborative data submission** and revision from multiple remote computers;
4. **User friendly and accessible** from various internet connected devices;
5. **Allows for various levels of access** to the data and information products (e.g. ensure that control of user credentials is possible).

Operational ASF control map – Chernigov Oblast, Ukraine



A zoom into the dynamic map

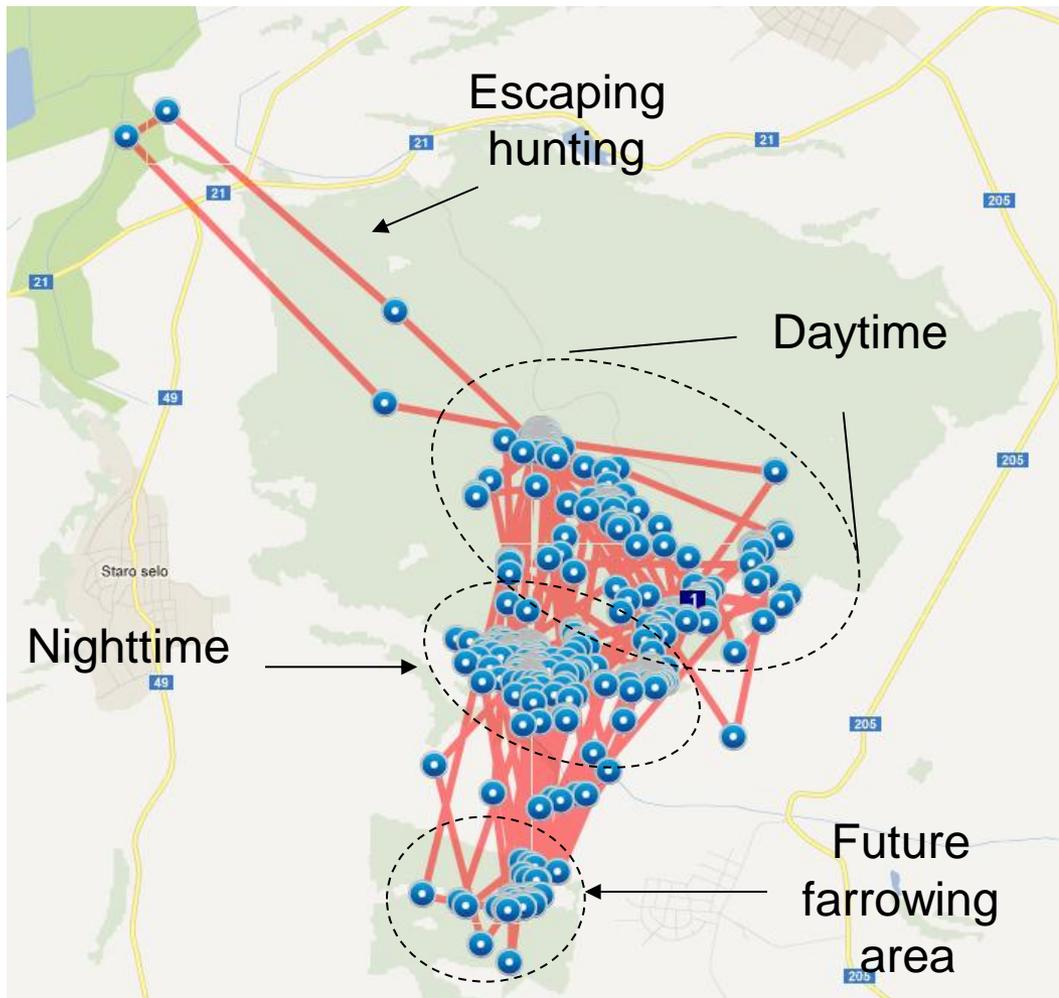


Way forward with ASF problem, wild boar and wildlife disease issues

- Systematic epidemiological studies on ASF in the affected countries are badly needed;
- A manual on disease management in wild boar (other wildlife?) based on the best available knowledge and expertise (EC's experience with CSF is really valuable);
- Wildlife disease training centre/s (laboratory) needed;
- Country/region specific projects piloting management approach to disease prevention and control at the livestock / wildlife interface (CSF, ASF, FMD, AI, rabies +)

Territoriality and movements

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



- Normally very small home ranges (4 km²);
- Very boring schedules 😊
- Disrupted by only food availability or disturbance

January

Movements of males and rut



Young male dispersal →



Farrowing

Pre-hunting stock



Re-unification of female groups

June

Movements to crops & food-rich areas





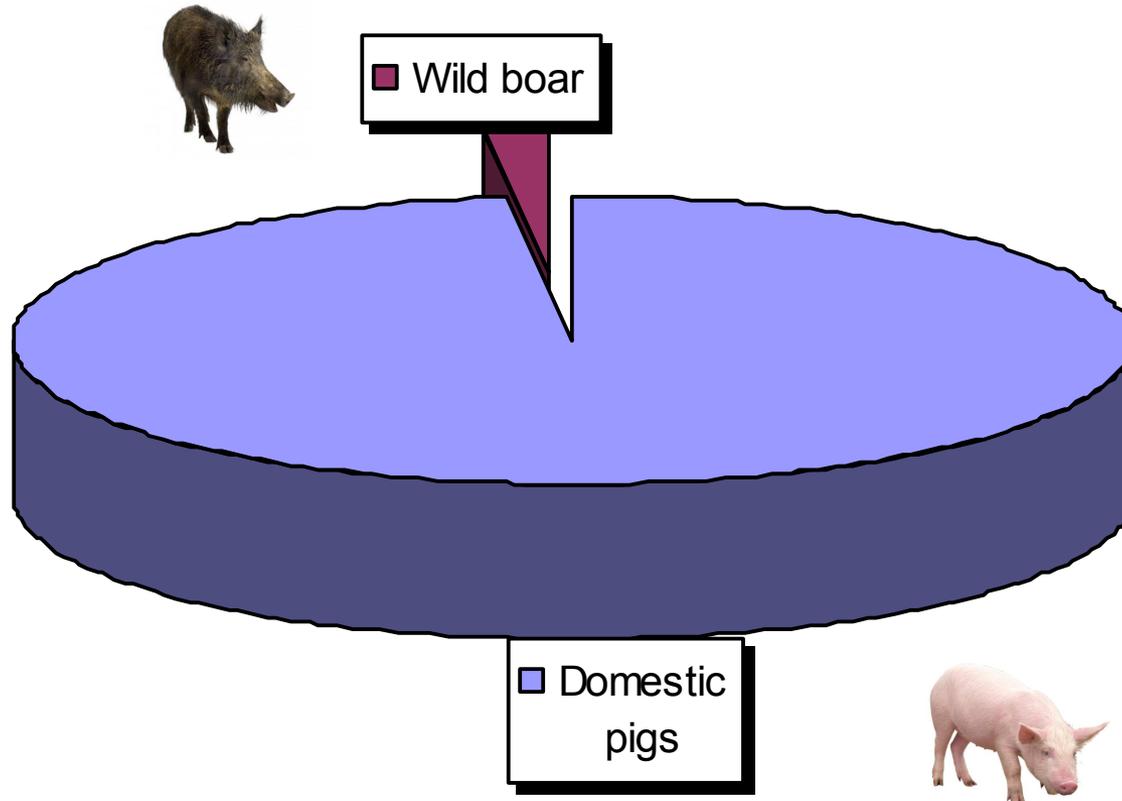
Movement types

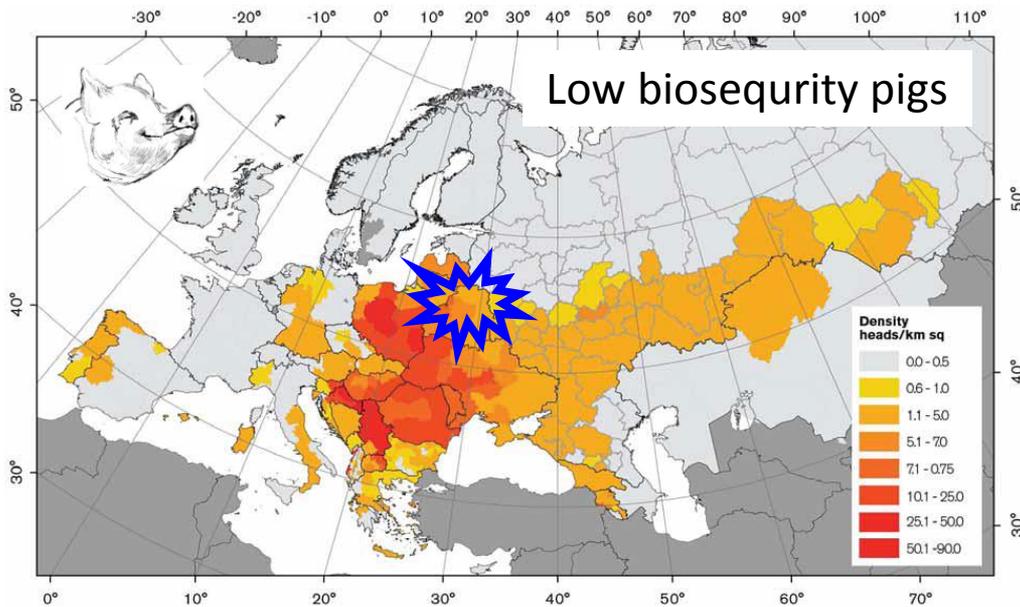
- ☞ Daily movements of families and boars (<2 km);
- ☞ Seasonal feeding raids and congregations (up to 5-10 km rarely longer);
- ☞ Boar movements at rut (25-30 km) and juvenile male dispersal (sometimes up to 150-200 km);
- ☞ Seasonal shift of habitats (in the mountains and deserts, at the edge of the distribution range);
- ☞ Emergency (flood, fire, hunting pressure) induced movements.

THANKS FOR ATTENTION

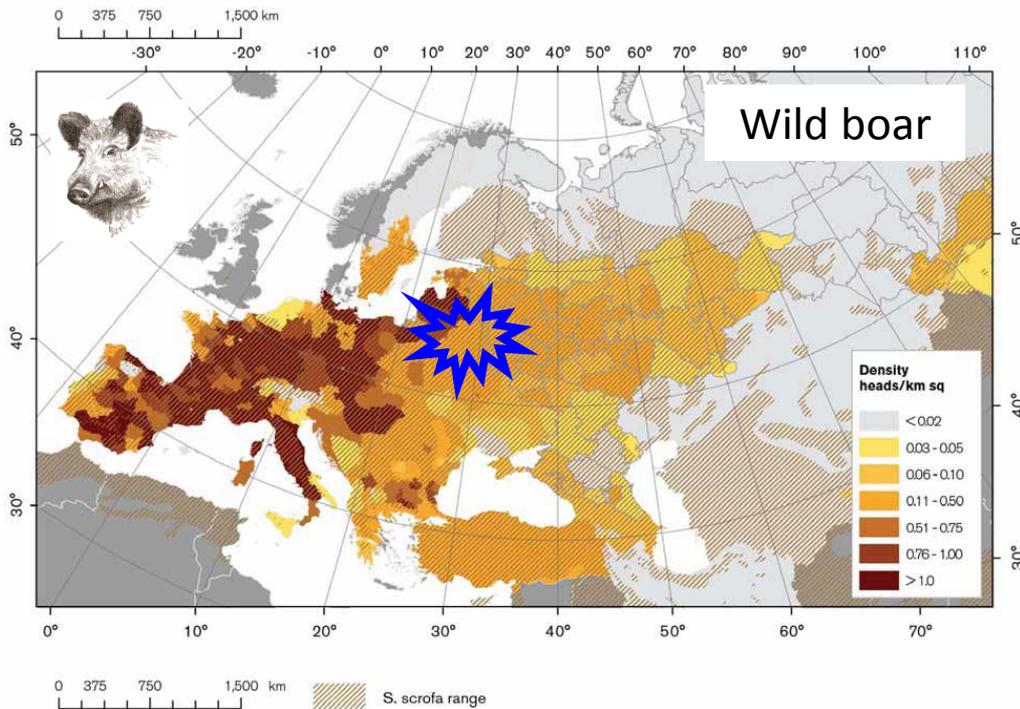


Wild Boar makes only 1.9 % of the susceptible population in the ASF affected and at risk countries





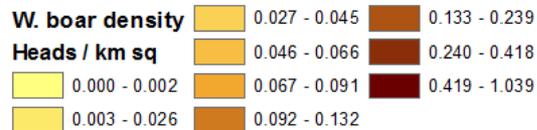
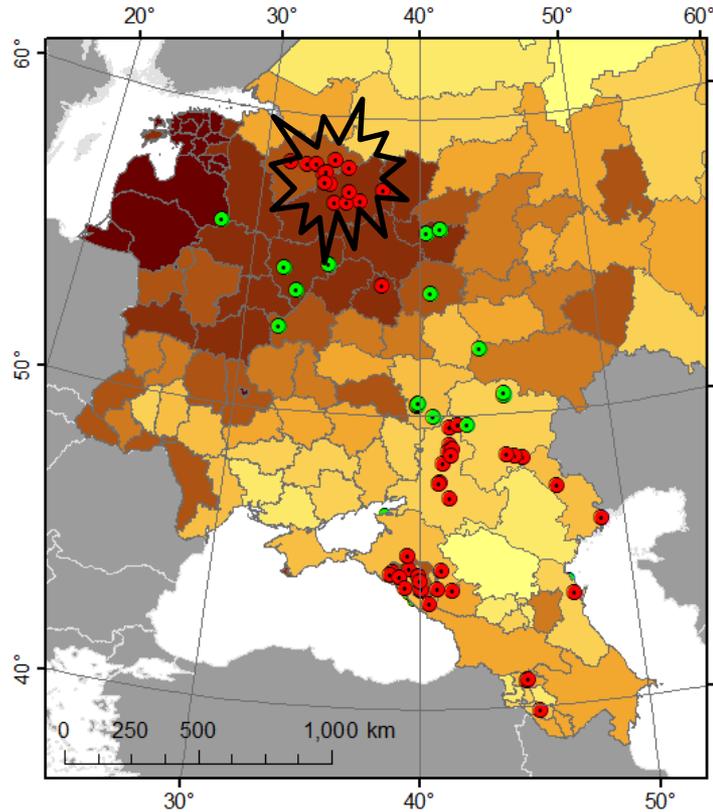
ASF is likely to endemically persist in domestic pigs in Eastern Europe for a long time (YEARS !) and will expand to the West



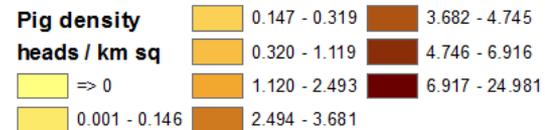
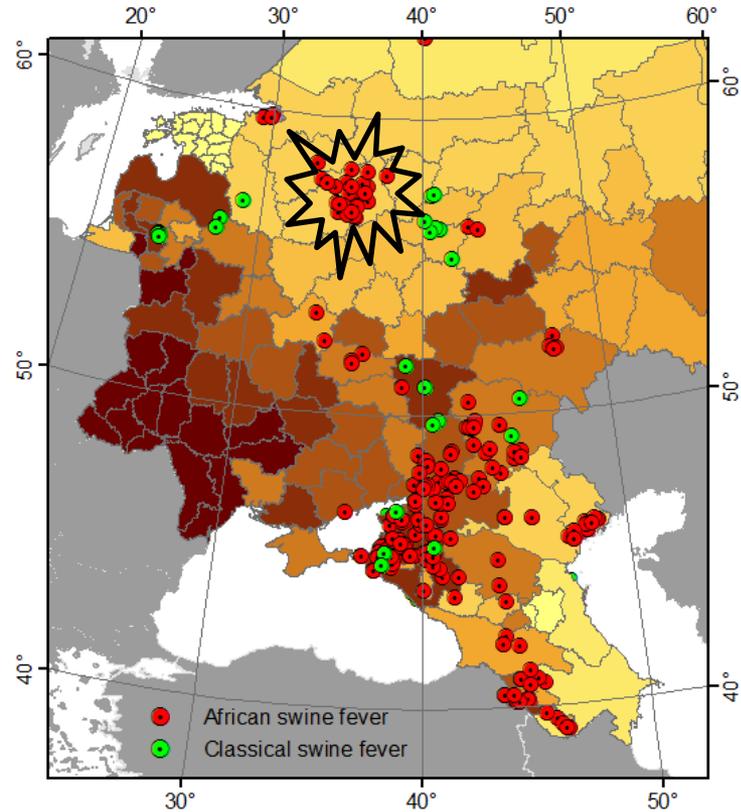
As ASF progressively expands westwards there is a high risk that it arrives to the areas where wild boar population is extremely high (e.g. up to **10 heads / km²**)

ASF v CSF in wild boar and LB pigs in 2010-2012

WILD BOAR DENSITY



LB PIG DENSITY



Duration of freezing conditions

