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Wisdom of the crowd or none the wiser: Participatory risk mapping of African Swine Fever

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1. Hypothesis

For the identification of regions with a high risk of ASF introduction in wild boar, we developed a novel participatory mapping system (Participatory risk mapping network for animal diseases, **PRMNAD**). We hypothesised that aggregation of multiple spatial estimates would diminish the role of individual errors.

2. Materials and Methods

PRMNAD users were asked to evaluate map-based risk information to predict ASF spread. A congruence-based spatial index (C_S) was used to compare individual- and aggregate- predictions against the true disease status that emerged.

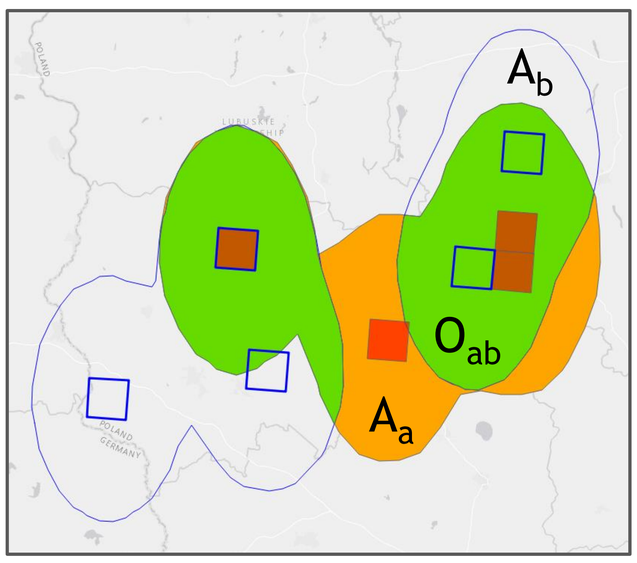

Fig. 1: Calculation of relative spatial congruence ($C_{S,ab}$) between an ASF affected area (A_a orange) and an area of disease prediction (A_b blue line), considering the overlap of both areas (O_{ab} green).

$$C_{S,ab} = \left(\frac{O_{ab}}{A_a}\right) \times \left(\frac{O_{ab}}{A_b}\right)$$

Reference: Gatto CAFR, Cohn-Haft M (2021) Spatial Congruence Analysis (SCAN): A method for detecting biogeographical patterns based on species range congruences. PLoS ONE 16(5): e0245818. https://doi.org/10.1371/journal.pone.0245818

3. Results

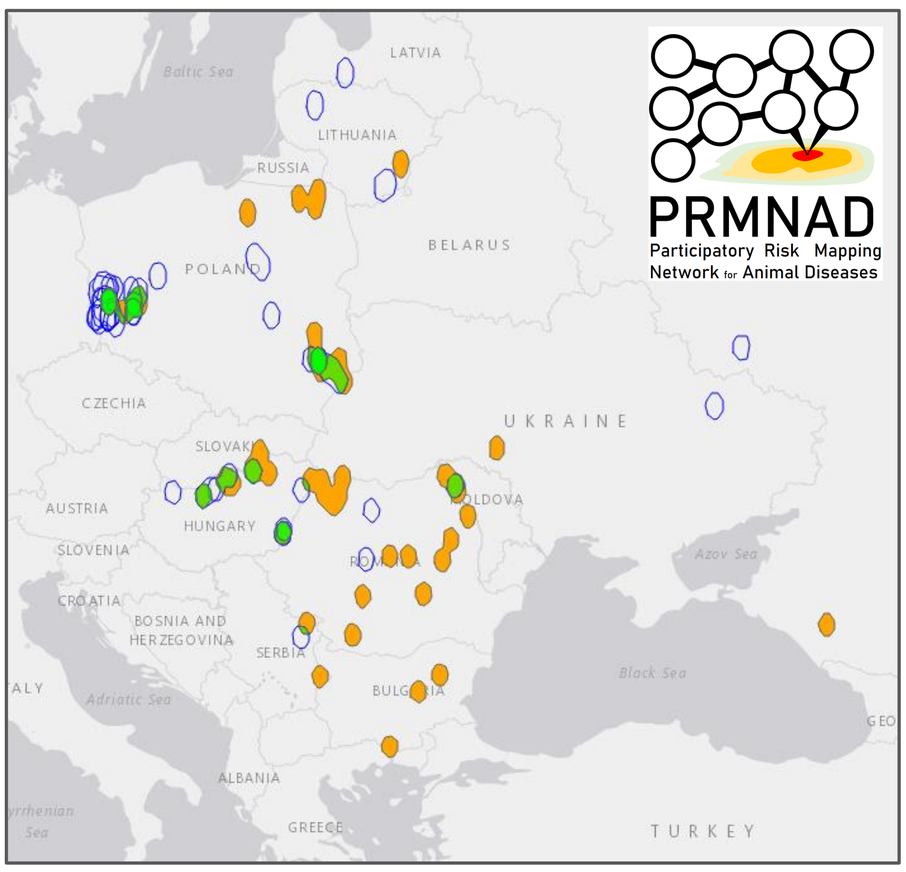

Fig. 2: Map showing areas of ASF occurrence (orange), disease prediction (blue) and their overlap (green).

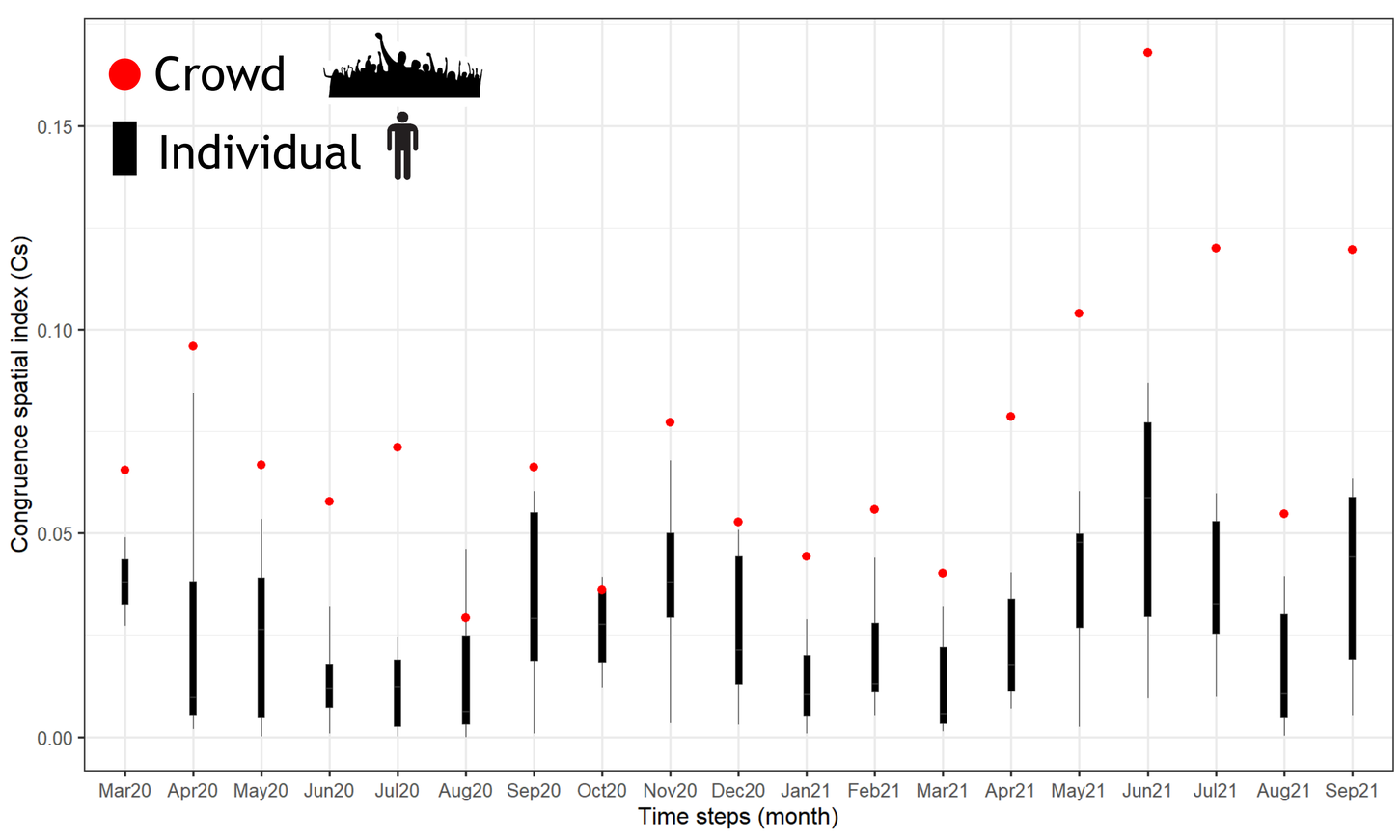

Fig. 3: Relative area congruence of ASF occurrence with spatial disease predictions either from individual risk assessors (**black** box plots) or their spatial aggregate (red dots) for each month.

4. Conclusion

Our findings extend the statistical phenomenon of crowd wisdom to spatial disease mapping, thereby revealing a mechanism for potentially improving the accuracy of spatial risk estimates.

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