UNIVERSITY OF COPENHAGEN
DEPARTMENT OF VETERINARY AND ANIMAL SCIENCES

Modelling the Spread and Control of African Swine Fever in Denmark

Mossa Merhi Reimert, Matt Denwood, Anette Ella Boklund, Tariq Halasa

Background

The threat of African Swine Fever (ASF) continues to increase within Europe, particularly in areas with high concentrations of wild boar. Simulation models of disease spread can help us understand the risks of transmission, the spread and control.

Objective

Study the potential spread and control of ASF through Denmark using a simulation model incorporating pathogen spread within and between free-ranging wild boar and domestic farms.

Methods

A unified stochastic spatio-temporal agent-based model, containing two distinct animal populations (1, 2), and their ASF disease spread dynamics (3, 4, 5):

(1) A disease-spread model within domestic pig farms.

(2) An ecological model of free-ranging wild boar combined with an ASF disease model in the same population.

(3) Model the interface between wild boar and domestic pigs.

(4) Model the potential spread of ASF via insects.

(5) Model control measures for ASF.

Modelling Framework

Designing and implementing a simulation framework that can combine models (1) and (2) is not straight forward; e.g. the domestic farms have fixed locations, while wild boars are roaming, with dynamic population counts.

Implementations using high-performance, low-level programming languages such as C/C++ and Rust are being explored.

Research outcome

An integrated guideline to the control of ASF within wild boar and domestic pigs.

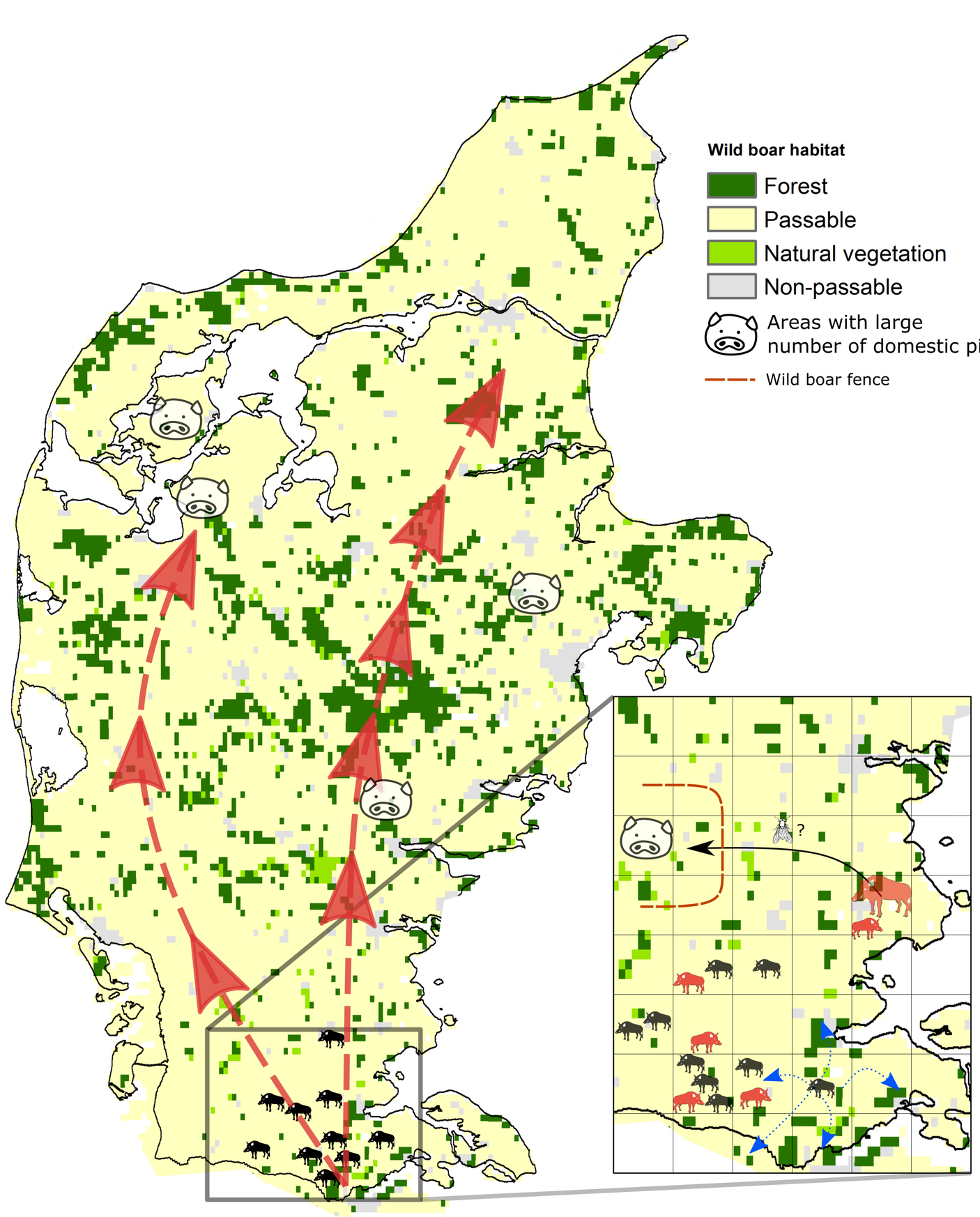

Figure 1: Schematic of the interface between domestic pigs and wild boars in the model
Jutland, Denmark, wild boar can reside in green habitats and migrate in yellow habitats, grey habitats are impassable to wild boar, e.g. urban areas. The red arrows show potential migration routes for wild boars from their current population range in southern Jutland. Red boars symbolise infected wild boar. Blue arrows show dispersal of wild boars in arbitrary directions. The fly symbolises a mechanical vector of transmission to domestic pigs.

We acknowledge financial support for this PhD project from the Danish Veterinary and Food Administration (FVST).

Mossa Merhi Reimert, Ph.d.-Student
Section for Animal Welfare and Disease Control
Department of Veterinary and Animal Sciences
University of Copenhagen
Email: mossa@sund.ku.dk