
IMPROVING SURVEILLANCE OF EMERGING INFECTIOUS DISEASES: ECOLOGICAL MODELLING OF THE SPATIAL DISTRIBUTION OF WILD WATERBIRDS TO IDENTIFY MAIN AREAS OF AVIAN INFLUENZA VIRUSES CIRCULATION IN THE INNER NIGER DELTA, MALI

Cappelle J¹, Girard O², Fofana B³, Gaidet N¹ and Gilbert M⁴

¹CIRAD-ES, AGIRs, Montpellier, France; ²Réserve de Chanteloup, France; ³Wetlands International, Direction Nationale des Eaux et Forêts, Mali; Nicolas Gaidet¹, ⁴CIRAD-ES, AGIRs, Montpellier, France.

Presenting author: Cappelle, Julien julien.cappelle@cirad.fr

Predicting areas of emergence when no epidemiological data is yet available is essential to implement efficient surveillance programs. The Inner Niger Delta (IND) in Mali is a major African wetlands where >1 million Palearctic and African waterbirds congregate. Our objective was to model the spatial distribution of these birds recognised as the main reservoir of Avian Influenza Viruses (AIV), in order to predict where these viruses would be more likely to circulate in the IND. We developed five generalized models and a boosted regression trees model (BRTs) based on total aerial bird counts over six years and high temporal resolution (10 days) remotely sensed environmental variables to predict the spatial distribution of four waterbirds groups. The predicted waterbirds abundances were weighted with an epidemiological indicator based on the prevalence of low pathogenic AIV reported in the literature. BRTs model had the best predictive power and allowed predicting the high variability of the IND. Years with a low flood level showed areas with higher risk of circulation and had better spatial distribution predictions. The model identified for each year few areas with a higher risk of avian influenza circulation. This model can be applied every 10 days to evaluate the risk of AIV emergence in wild waterbirds. By taking into account the variability of the IND, it allows better targeting of areas considered for surveillance. Applications of this methodology could enhance the control of emerging diseases at a local and regional scale, especially when scarce resources are available for surveillance programs.