Modelling Bluetongue Vector Occurrence Using GIS and Remote Sensing Techniques

H. Martins[1*] T. Nunes[1] F. Boinas[2]

Bluetongue (BT) is an infectious non-contagious disease which mainly affects domestic ruminants. It is caused by an arbovirus (BTV) from the family *Reoviridae* and its transmission is commonly associated with an intermediate arthropod host from the genus *Culicoides*. *Culicoides imicola* is the main vector of BTV in the Mediterranean Basin. Entomological surveillance programmes make it possible to collect continuously data of vital importance for the spatial and temporal investigation of BT vector distribution. In May 2005, Portugal has implemented this programme, which is providing a considerable amount of data concerning the abundance, and spatial and temporal distribution of several *Culicoides* species. Remote sensing is the process of acquiring data about a geographical object through several aircrafts or satellites built-in sensors and thus allowing the collection of useful information to characterize biophysical, climatic and environmental variables. Some of these variables influence survival, development and dispersion of BT vectors.

The combination of satellite imagery and entomological surveillance data using geographical information systems (GIS) helps to develop models for the prediction of spatial occurrence of disease vectors. These models might be useful to identify risk areas for disease transmission and are therefore important for the development of targeted sanitary control measures. Two mathematical approaches were selected to model the spatial occurrence of *Culicoides imicola*, i.e. discriminant analysis and logistic regression. Climatic, remotely sensed and national entomological data were used to build both models. Statistical packages and GIS were then used to implement these models. The discriminant analysis model was less accurate, presenting a sensitivity of 76.6% and a specificity of 75.3%. The logistic regression model was more robust and presented 80.9% sensitivity and 83.6% specificity. Descriptive spatial statistics were then calculated to characterize the landscape features associated with the presence/absence of BT vectors.

Keywords: Bluetongue – Vector – Spatial distribution – Remote sensing.

1. Direcção de Serviços de Veterinária, Angra do Heroísmo, Portugal.
2. Centro de Investigação Interdisciplinar em Sanidade Animal, Faculdade de Medicina Veterinária, Polo Universitário do Alto da Ajuda, Avenida da Universidade Técnica, 1300-477 Lisboa, Portugal.

* Corresponding author
Tel.: +351 1 65 28 56; Fax: +351 2 13 65 28 87
E-mail: hfpmartins@gmail.com