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Background

In Senegal, the 2007 epidemic of African horse sickness (AHS) caused the death of 1,169 horses and considerable economic loss (Akakpo et al. 2011). The vectors responsible for biological transmission of the virus belong to the genus *Culicoides* (Diptera: Ceratopogonidae). In Senegal, studies on *Culicoides* are rare, out of date and did not specifically target the species in the vicinity of horses. Thus we initiated two studies in 2011 to better understand the **dynamics and distribution of the *Culicoides* of Senegal** and their involvement in the transmission of AHS virus (AHSV).

Dynamics of *Culicoides* in the Niayes region

Methods

A one-year monthly trapping campaign using two light traps for three consecutive nights in five sites of the Niayes region (Figure 1) was carried out in 2011-2012.



Figure 1: Locations of *Culicoides* trapping sites in the Niayes of Senegal

Results

✓ **224,665** specimens of the *Culicoides* genus (in 354 collections) belonging to at least 24 different species.

✓ The most abundant species (Figure 2) were *C. oxystoma*, *C. kingi*, *C. imicola*, *C. enderleini* and *C. nivosus*

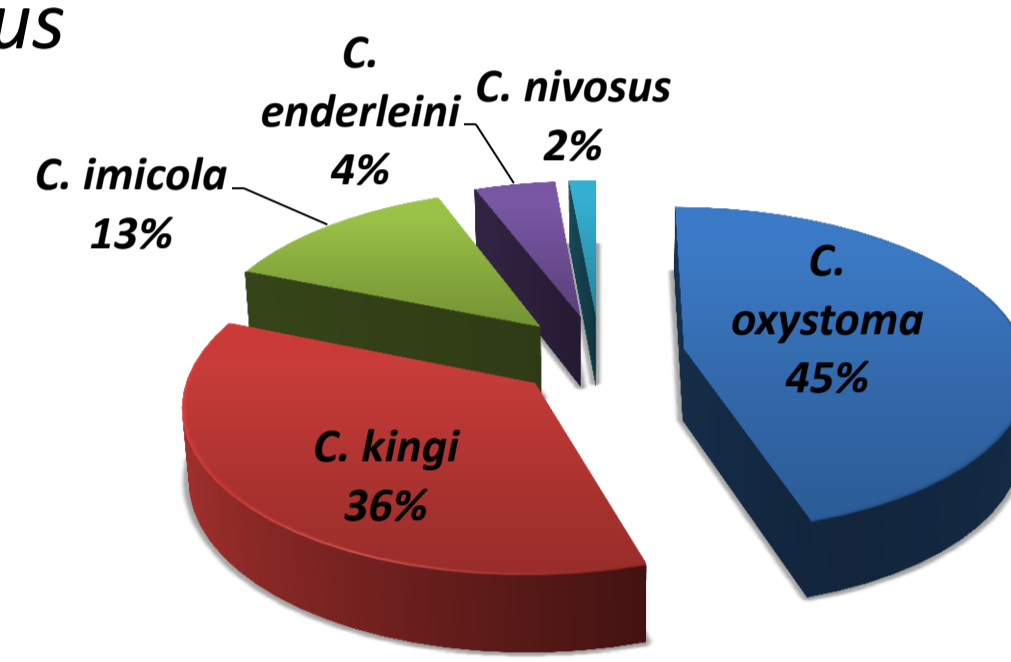


Figure 2: Proportion of total catch for the dominant *Culicoides* species in the Niayes of Senegal

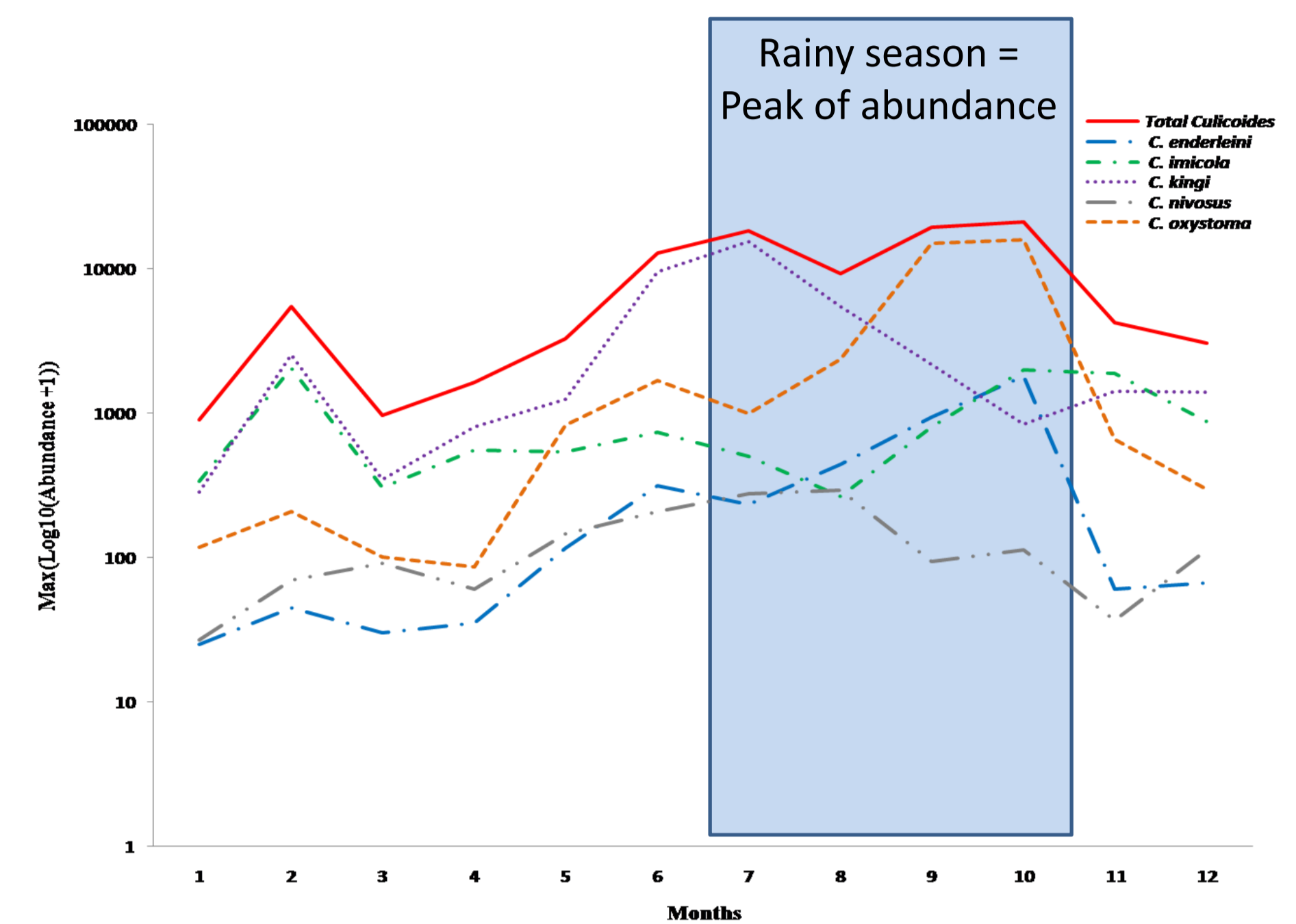


Figure 3: Seasonal variations of dominant *Culicoides* species in the Niayes of Senegal.

See complete results in Diarra *et al.* Parasites & Vectors 2014, 7:147.



Nation-wide distribution of *Culicoides*

In 2012, a nation-wide *Culicoides* trapping campaign was set up to better describe spatial distribution of *Culicoides* in Senegal.

Methods

➤ Two successive collection nights were carried out in 98 sites in 12 (out of 14) regions of Senegal

➤ **Period:** End of the rainy season (September - October).

➤ **Climatic and environmental variables:** land surface temperatures (LST) of the day and night, normalized difference vegetation index (NDVI), rainfall, livestock density, land cover.

➤ **MaxEnt** (Maximum entropy) model (Phillips *et al.*, 2006) to characterise suitable habitats of 4 proven or potential vectors of AHSV and bluetongue virus (BTV) in Senegal (*C. oxystoma*, *C. imicola*, *C. miombo* and *C. bolitinos*)

➤ **GLM** (Generalized linear models) model (McCullagh and Nelder, 1989) for mapping the abundance of *C. oxystoma*, *C. imicola*, *C. miombo* and *C. bolitinos*

Results

More than **1,367,000** *Culicoides* belonging to at least 35 species were collected in this spatial survey (Figure 4 and 5).

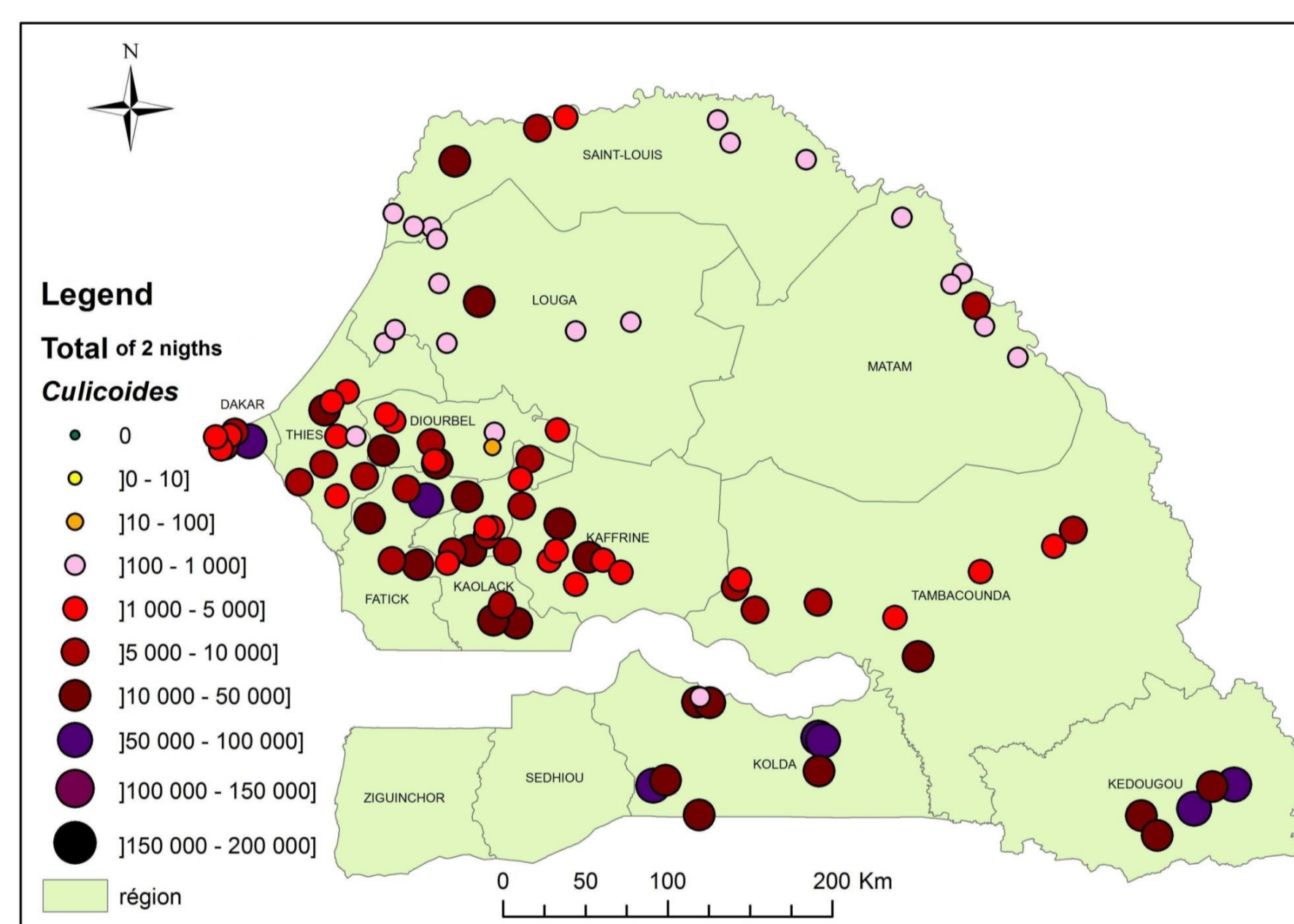


Figure 4: Spatial distribution of *Culicoides* in Senegal

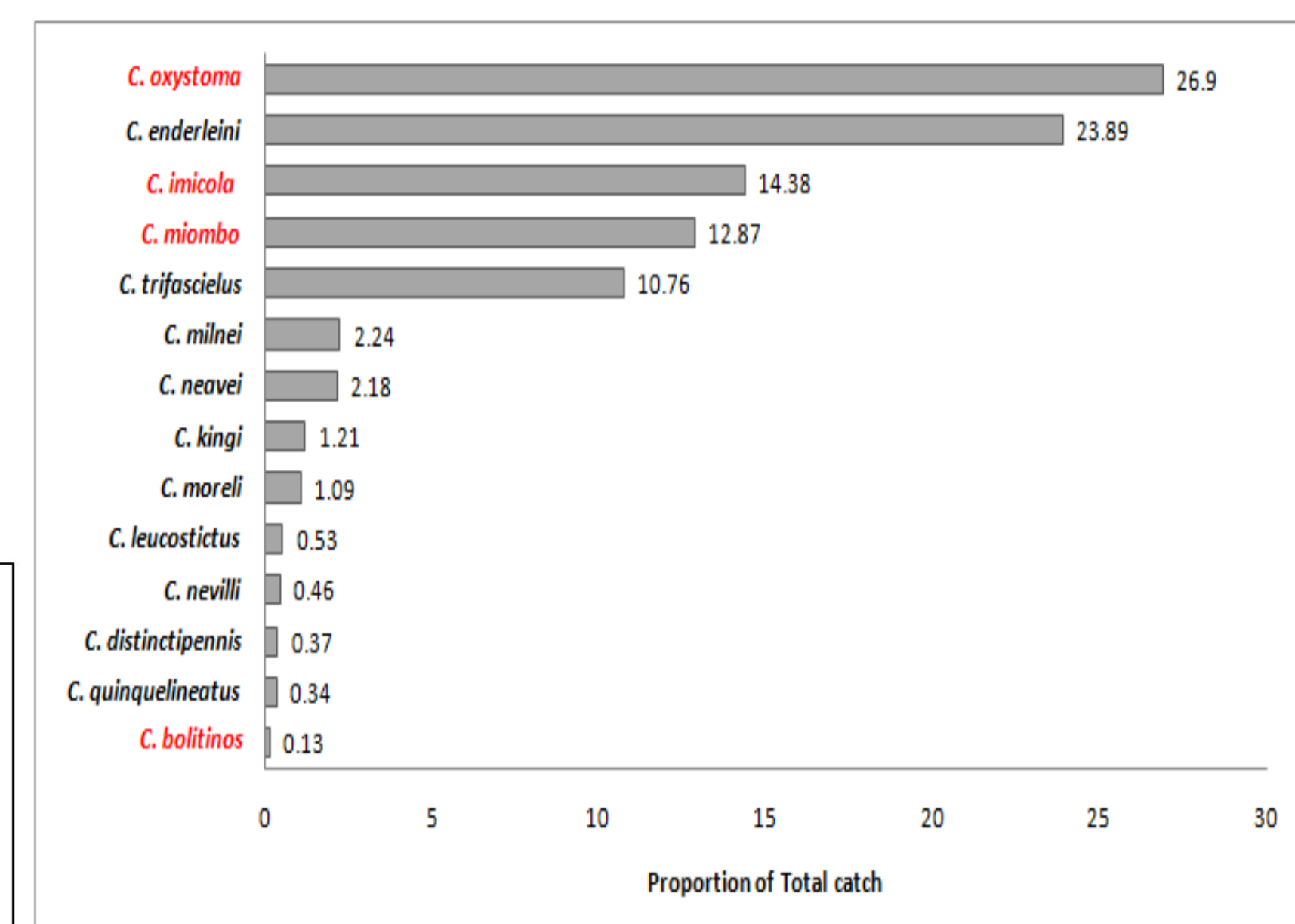


Figure 5: Diversity of *Culicoides* species in 2012. Species with proportion of total catch > 0.1%

Important species for AHSV and BTV transmission:
C. oxystoma: Suspected BTV vector & very abundant
C. imicola: Proven BTV and AHSV vector & abundant
C. miombo: Suspected BTV vector & abundant
C. bolitinos: Proven vector BTV & not abundant

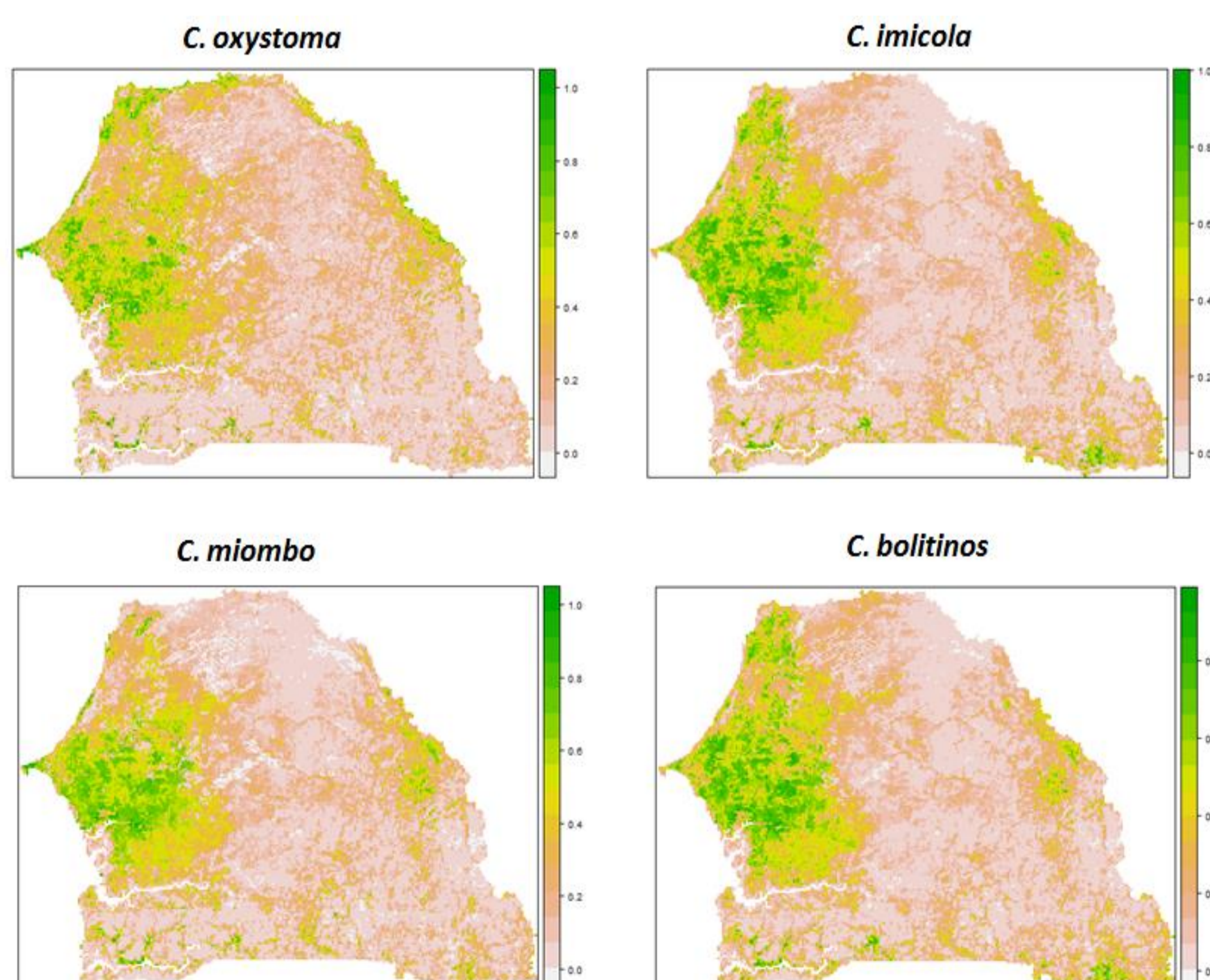


Figure 6: Probability of presence for *C. imicola*, *C. bolitinos* (2 proven vectors of BTV and/or AHSV), *C. oxystoma*, *C. miombo* (2 suspected vectors of BTV) in Senegal

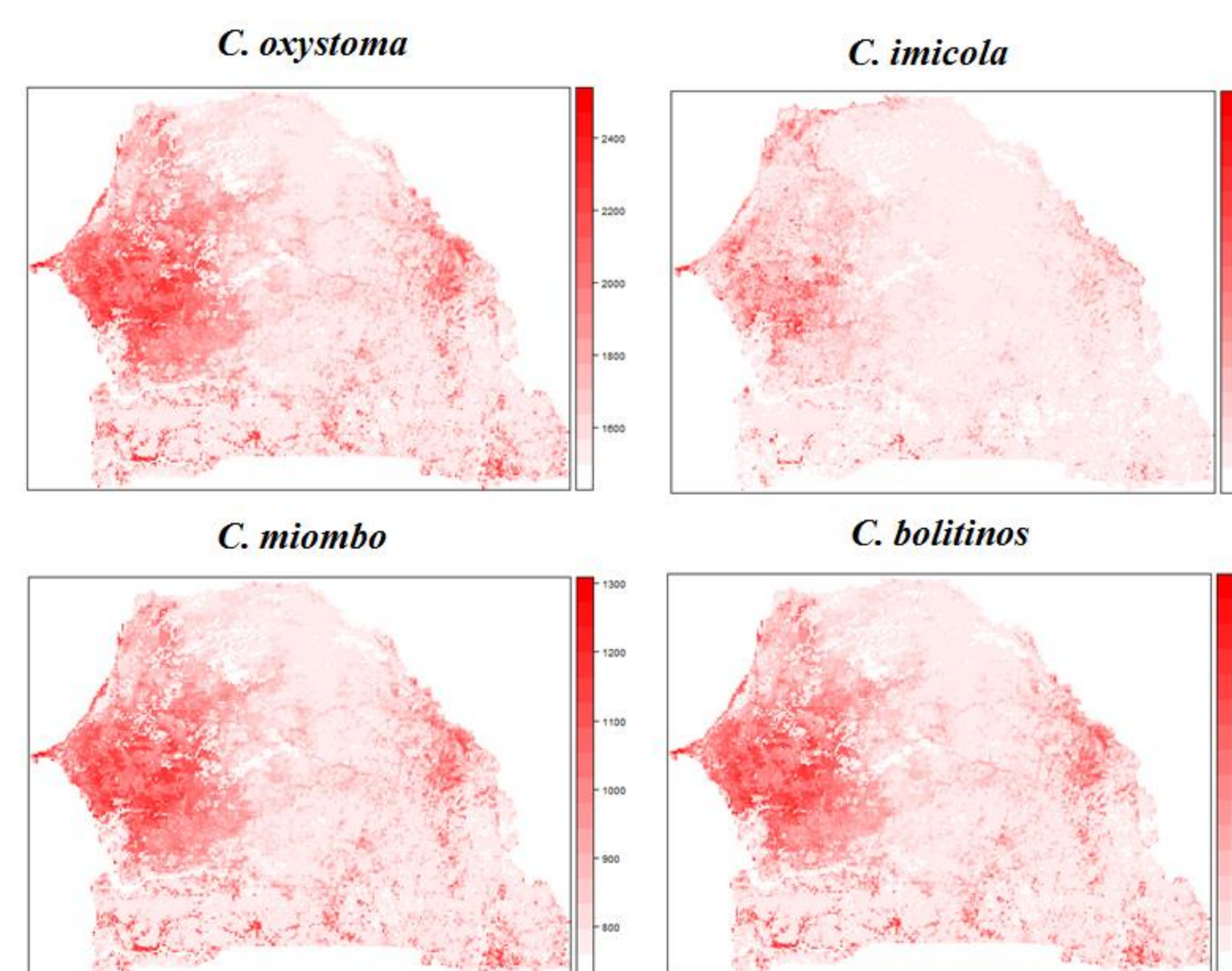


Figure 7: Abundance model (GLM) for *C. imicola*, *C. bolitinos* (2 proven vectors of BTV and/or AHSV), *C. oxystoma*, *C. miombo* (2 suspected vectors of BTV) in Senegal

References:

Akakpo, A. J., Wombou, T. C. M., Mankor, A. & Ly, C. 2011 Impact économique de l'épizootie de la peste équine de 2007 au Sénégal. *Bulletin of Animal Health and Production of Africa* 59, 1-16.
 McCullagh P. and Nelder J. Generalized linear models. 1989.
 Phillips, S.J., R.P. Anderson, R.E. Schapire, 2006. Maximum entropy modeling of species geographic distributions. *Ecological Modelling* 190: 231-259.

Conclusion: Overall, this work allowed updating the list of *Culicoides* species of Senegal, describing their dynamics, characterising suitable habitats and mapping abundance of the potential vectors of AHS and bluetongue viruses in Senegal.