

<b>PROJECT I.D.</b>
1.1. Acronym: <b>CULCONTROL-DST2007013</b>
1.2. Project title: Development and optimisation of programme for risk prediction and the integrated control of <i>Culicoides</i> spp. (Diptera: Ceratopogonidae), vectors of bluetongue virus
1.3. Financial backers:
1.4. Participating bodies:
<b>NEIKER DETAILS</b>
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1.6. Start date: November 2007
1.7. End date: November 2010

### Summary:

The project aims to develop strategies for the integrated control of ceratopogonid diptera of the *Culicoides* genus involved in the transmission of bluetongue in the Basque Country. The first strategy focuses on the systematic identification of the species of the *Culicoides* genus using morphological and molecular methods. Here we deal with the detection and monitoring of species that are foreign to our fauna, especially *Culicoides imicola*. Integrated control is based on optimising the capture of *Culicoides*, both within the cowshed and outside, by deeper study of the chemical ecology of the different species of *Culicoides*, studying how they behave in the presence of different volatile chemical compounds. The use of booster attractants has led to European protocols for the monitoring and control of bluetongue vectors being reviewed and, it is therefore necessary to test said compounds in the meteorological conditions of the Basque Country. It is also essential to ensure that the few remaining vectors do not approach the cattle, making it necessary to choose a good attraction repellent for them. This has traditionally been done by treating the skin of the animals with N,N-diethyl-m-toluamide, but its high toxicity for the environment, the cattle themselves and the trophic chain make it advisable to find other less harmful options that are equally effective. Another aspect of the project is the detection of the BTV virus in *Culicoides* species in the Basque Country to identify the epidemiological routes of the disease, as well as studying the phenology of the most abundant to correlate them with the meteorological data to draw up a mathematical model for predicting the risks of propagation of the disease.

**Overall Aim:** To study the biology, chemical ecology and systematics of the *Culicoides* genus in the Basque Country to develop a system for risk prediction and the integrated control of bluetongue vectors.

### Specific Aims:

1. – Testing and optimisation of a method for the massive trapping of bluetongue vector insects.
2. – Testing of potential natural repellents possibly applicable to the animal.
3. – Identification of the species of *Culicoides* present in the Basque Country using morphological and molecular methods where necessary.
4. – Identification of the vector insects intervening in the epidemiological routes of the virus by detection in the insect using PCR.
5. – Creation of a mathematical model for predicting the risks of propagation of the disease on the basis of meteorological data, phenological data of its vectors and their degree of differential association to allow the detection of critical annual moments of the greatest risk of transmission and its preventive control.
6. – Study of the biological cycle of the most abundant species associated with cowsheds.

7. – Transfer of the knowledge and technology generated to the sector for the correct fine-tuning of a programme for the monitoring-control-reduction of populations of *Culicoides* spp. in the three provinces making up the Basque Country.

#### Results:

**Objective 1** – Testing and optimisation of a method for the massive trapping of bluetongue vector insects: We recommend installing a **CDC trap baited with DL-Lactic acid continuously in use on the farms most affected by bluetongue**. This would be part of a permanent system exclusively for the massive capture and elimination of *Culicoides* on the farms seen to be most vulnerable during explosion of the virus.

**Objective 2** – Testing of potential natural repellents possibly applicable for on-animal use: The insecticide substance azadirachtin extracted from the Neem tree, *Azadirachta indica* (Meliaceae), has shown promising results as a potential repellent against *Culicoides* and may allow us to develop an alternative natural control method to synthetic repellents.

**Objective 3** – Identification of the species of *Culicoides* present in the Basque Country using morphological and molecular methods where necessary.

#### Survey Data:

- Total N° of traps installed: 60 (1,500 metres of wiring and construction of an electricity supply network for continuous operation on the most affected farms in Oartzualdea).
- Traps in cowsheds - **504** samples analysed in 1,2-propanodiol and **168** dry-separated samples.
- Traps on pasture – **2,520** liquid samples analysed.
- Total N° of *Culicoides* identified in the whole survey: **205,968** individuals.

**Main species (in order of abundance):** *Culicoides obsoletus*, *Culicoides scoticus*, *Culicoides lupicaris*, *Culicoides punctatus*, *Culicoides festivipennis*, *Culicoides achrayi* cfr., *Culicoides pulicaris*, *Culicoides newsteadi*, *Culicoides circumscriptus*.

**Species with the highest population density (in order of abundance):** *Culicoides chiopterus*, *Culicoides stigma*, *Culicoides fagineus*, *Culicoides dewulfi*, *Culicoides furcillatus*, *Culicoides impunctatus*, *Culicoides subfascipennis*, *Culicoides pallidicornis*, *Culicoides imicola*, *Culicoides kibunensis*, *Culicoides comosioculatus*, *Ceratoculicoides havelkoi*.

#### Impact:

The knowledge acquired during the project will allow us to develop a risk prediction model for the disease, as well as set up an integrated programme to combat the spread of the disease, given that an understanding of the biological cycles of the different species of *Culicoides*, the availability of effective traps and *Culicoides* repellents will allow us to reduce the populations of the species by integrating handling practices and control measures that will reduce the spread of *Culicoides*. These measures will complement the official vaccination programmes carried out.

We should highlight the first record of the *Culicoides imicola* species in northern Spain:

Goldarazena A., Romón P., Aduriz G., Balenghien T., Baldet T., Delecolle J.C, 2008. First record of *Culicoides imicola*, the main vector of bluetongue virus in Europe, in the Basque Country (northern Spain). *Veterinary Record*, 162 (820-821)