



## One stop shop for vector mapping

A spatial decision support system for targeted  
vector surveillance and control.

# VECMAP



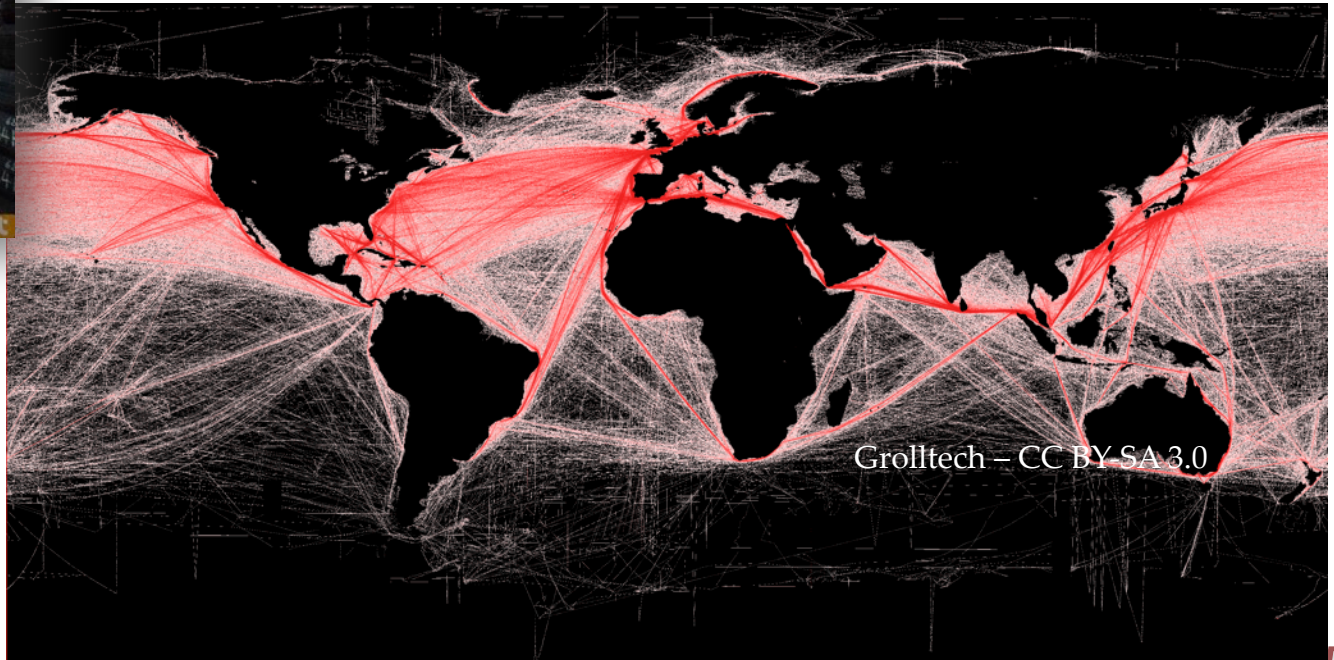
PPM

# Background

Globalised travel, trade and changing environments allow disease-carrying insects and tourists infected with these diseases to travel further.



*Traffic of goods*



# Background

Europe at risk of diseases transmitted by arthropods = *vectors*

- Mosquitoes
- Ticks
- Sandflies
- Culicoides .



*Ixodes ricinus*  
e.g. Lyme borreliosis



Disease transmission  
West Nile Virus, Rift Valley fever Virus *PPM*



# The problem

Need for precise information on distribution, abundance and spread of disease vectors

**BUT: Field surveys are labour intensive and expensive**

Cost can be reduced by combining strategic sampling and spatial models using remote sensing data

**BUT: Requires expertise and access to state of the art tools**



# The solution

VECMAP is a one-stop-shop to vector mapping:

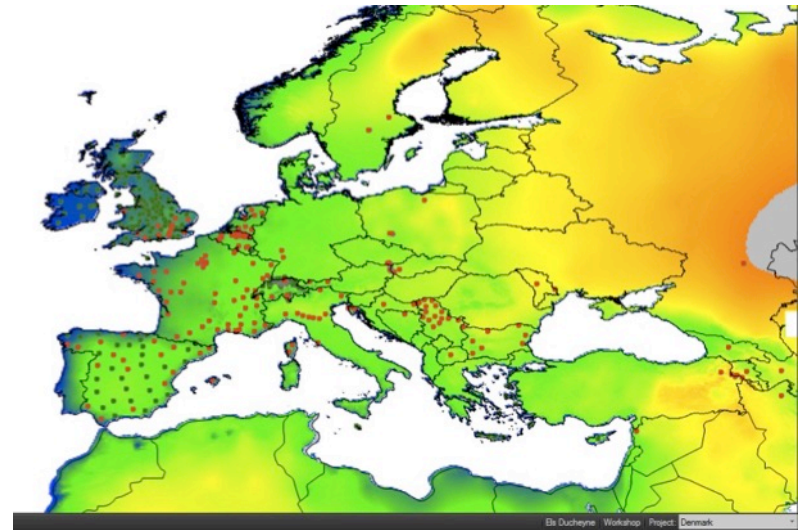
- That **integrates** the entire process of producing risk maps from sampling to spatial modeling into a single package
- That can be used by a **wide range** of practitioners
- That includes **supporting services**
  - Generic and on-demand training
  - Secured data management
  - Extended RS products
- That ensures **replicability** and **continuity**



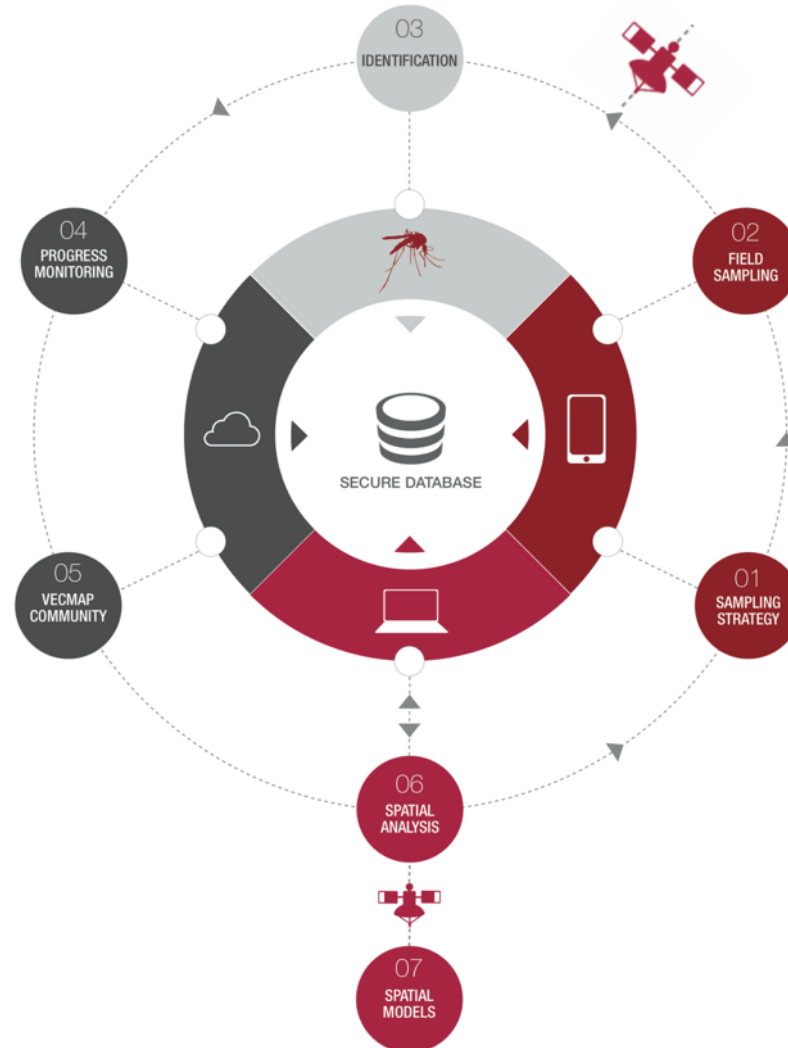
# How space helps








- Reduce sampling sites using sat images as prior knowledge
- Satellite imagery provides environmental indicators such as climatic seasonality and vegetation index predictors for spatial models can be developed.
- Satellite navigation reduces time to travel and optimizes routes for field sampling.



# The system

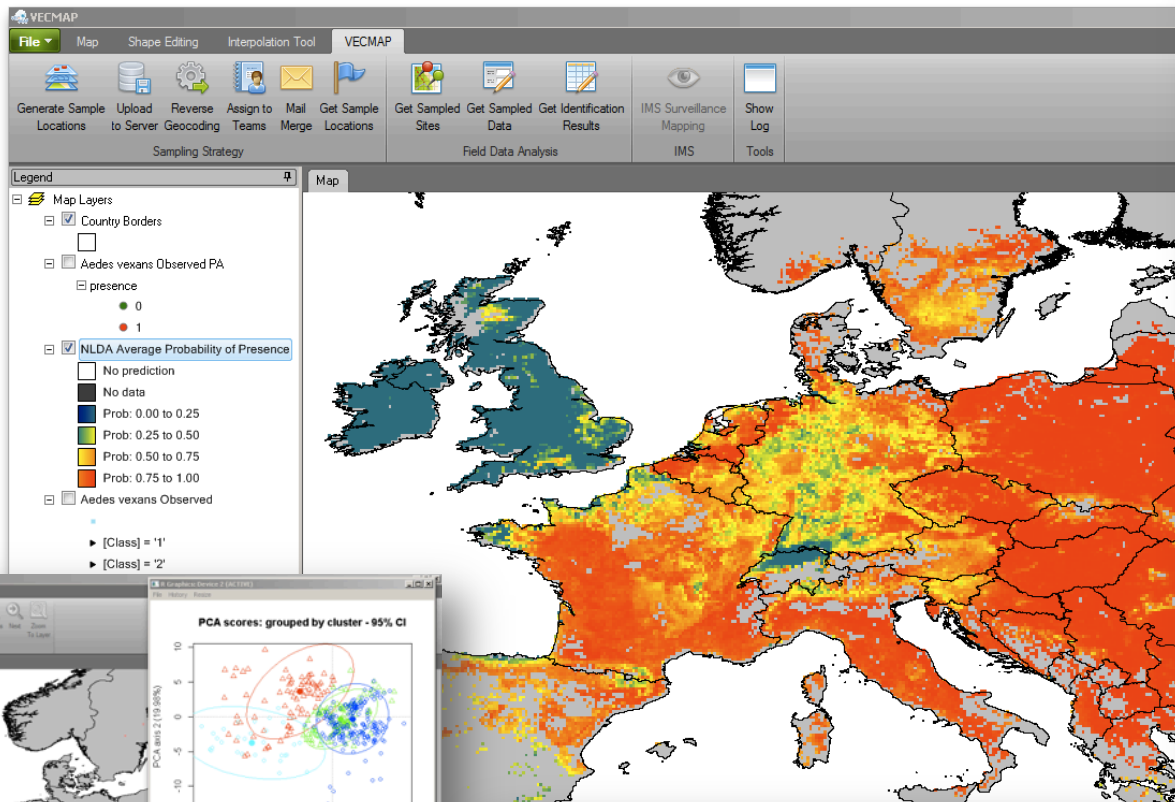


## Legend

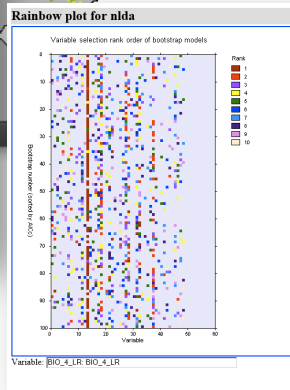
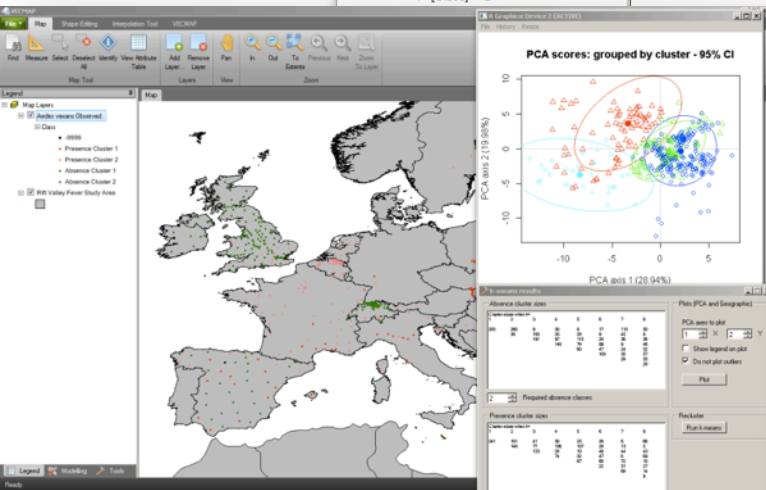
-  From the field
-  From your desktop
-  From your lab
-  From the cloud
-  Into secured central database

01. Planning your sampling strategy
02. Organizing your fieldwork
03. Identifying your samples
04. Monitoring your progress
05. Using information provided by the network
06. Conducting a spatial analysis of your data
07. Computing spatial distribution and abundance models

# VECMAP



- ### Modelling
- Imagery
    - Make Mask
    - Resize images
    - Convert to TIFF
    - Temporal Fourier Analysis (TFA)
  - Data Preparation
    - Import Text File
    - Point-in-polygon sampling
    - Polygon filtering
    - Clip points to mask
    - Balance/Code dataset
    - Generate Pseudo-Absence
    - Extract Data
    - Cluster Data
    - Aggregate
  - Exploratory
    - Exploratory spatial data analysis
  - Modelling
    - Non-Linear Discriminant Analysis (NLD)
    - Random Forest (RF)
    - Generalised Linear Modelling (GLM)
    - Zero Count Models (ZCM)
    - Boosted Regression Trees (BRT)
    - Model Based Gradient Boosting (mBoc)
    - Universal Kriging (UK)
    - Gaussian Random Fields (GRaF)
  - System
    - Check settings



### Variable list

1	BIO_1_LR	BIO_1_LR
2	BIO_1_LR	BIO_1_LR
3	BIO_1_LR	BIO_1_LR
4	BIO_1_LR	BIO_1_LR
5	BIO_1_LR	BIO_1_LR
6	BIO_1_LR	BIO_1_LR
7	BIO_1_LR	BIO_1_LR
8	BIO_1_LR	BIO_1_LR
9	BIO_1_LR	BIO_1_LR
10	BIO_1_LR	BIO_1_LR
11	BIO_1_LR	BIO_1_LR
12	BIO_1_LR	BIO_1_LR
13	BIO_1_LR	BIO_1_LR
14	BIO_1_LR	BIO_1_LR
15	BIO_1_LR	BIO_1_LR
16	BIO_1_LR	BIO_1_LR
17	BIO_1_LR	BIO_1_LR
18	BIO_1_LR	BIO_1_LR
19	BIO_1_LR	BIO_1_LR
20	ED180A0	Midline inf-red mean
21	ED180A1	Midline inf-red amplitude 1
22	ED180A2	Midline inf-red amplitude 2
23	ED180A3	Midline inf-red amplitude 3
24	ED180A4	Midline inf-red minimum
25	ED180A5	Midline inf-red maximum
26	ED180P1	Midline inf-red phase 1
27	ED180P2	Midline inf-red phase 2
28	ED180P3	Midline inf-red phase 3
29	ED180V0	Midline inf-red variance
30	ED180A0	Daytime LST mean





# VECMAP

## Benefits to society

- Prevents death and sickness by reducing the spread of vector-borne disease.
  - Providing early warnings of disease vector presence
  - Enabling efficient management of vector invasions
  - Directing nuisance control efforts in terms of place and time e.g. just after the hatching of eggs
- Reduces costs to public health authorities through:
  - Mapping and prediction efficiencies
  - Disease prevention



# VECMAP Commercial

Service modes	Software	On-Demand Info System	Full Service
Clients			
Research	VECMAP™ VECMAP™ Lite	+	-
Public & Non-Profit sector	+	SmartVEC™ LymeMap	+
Industry	-	ENTOMATIC	SensRiZK™





# VECMAP Commercial

- VECMAP upscaling:
  - VECMAP will potentially receive a third party grant in 2015.
  - The many VECMAP success stories have enabled the development of a potential independent R&D programme. This is planned for May 2015 and comprises re-invested revenue (30%) and grant funding (70%).
  - VECMAP is still transitioning from the pre-operational stage and will create new jobs as part of its upscaling.

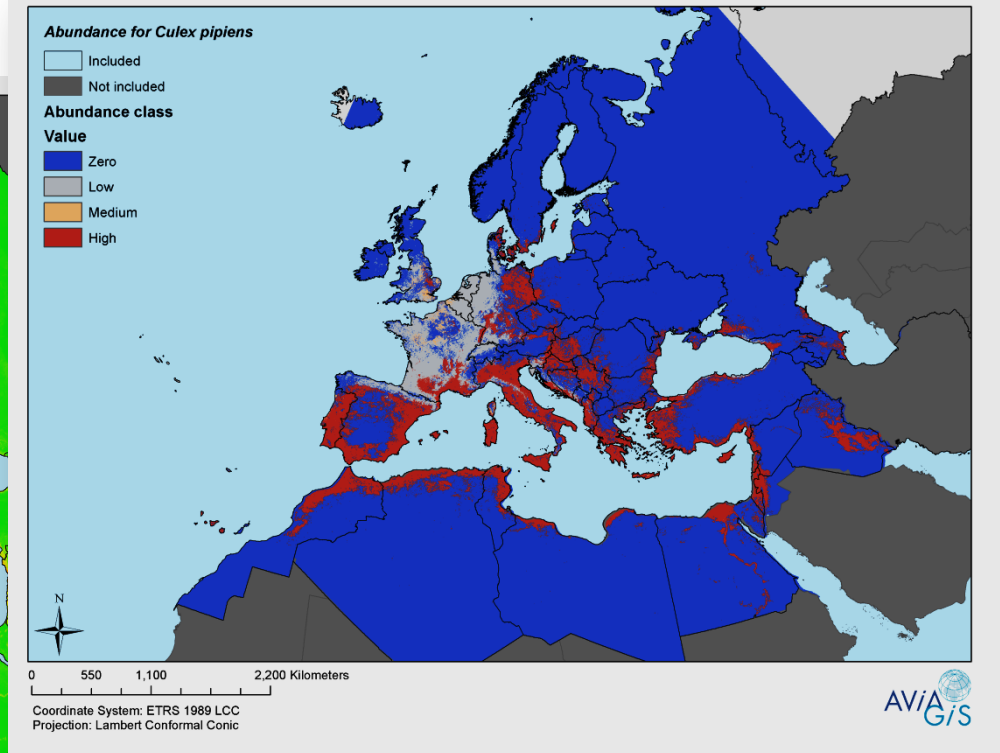
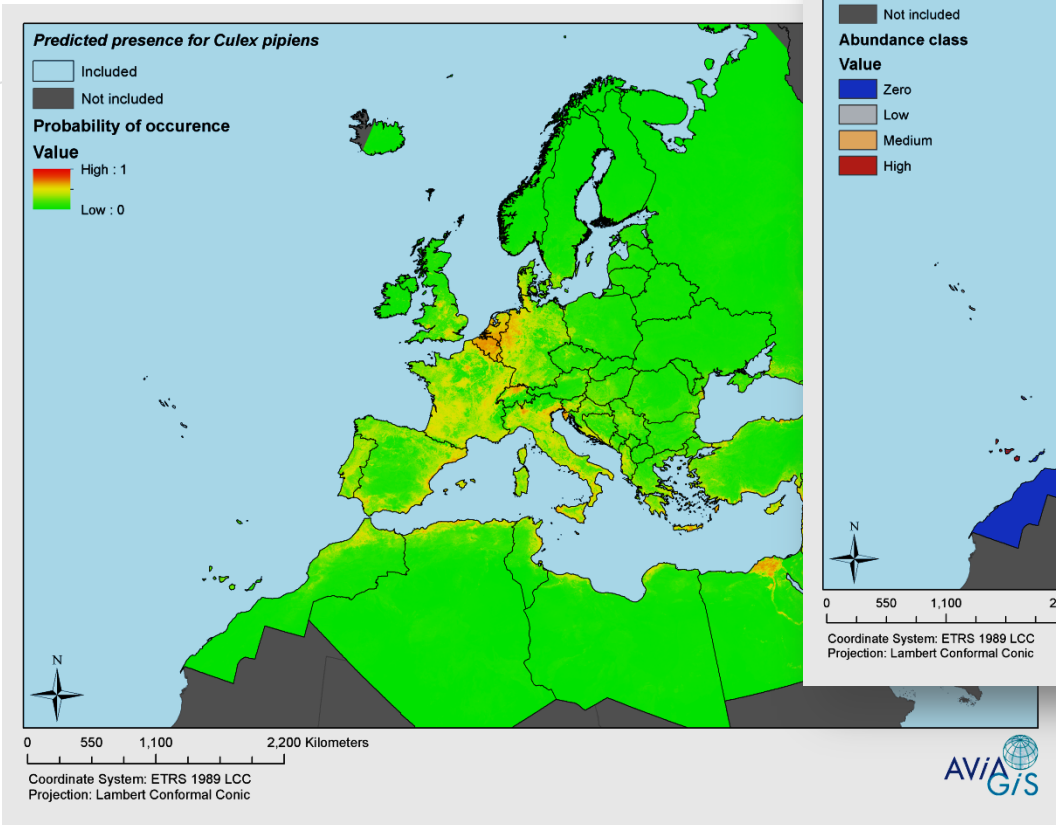


# VECMAP

## Success stories

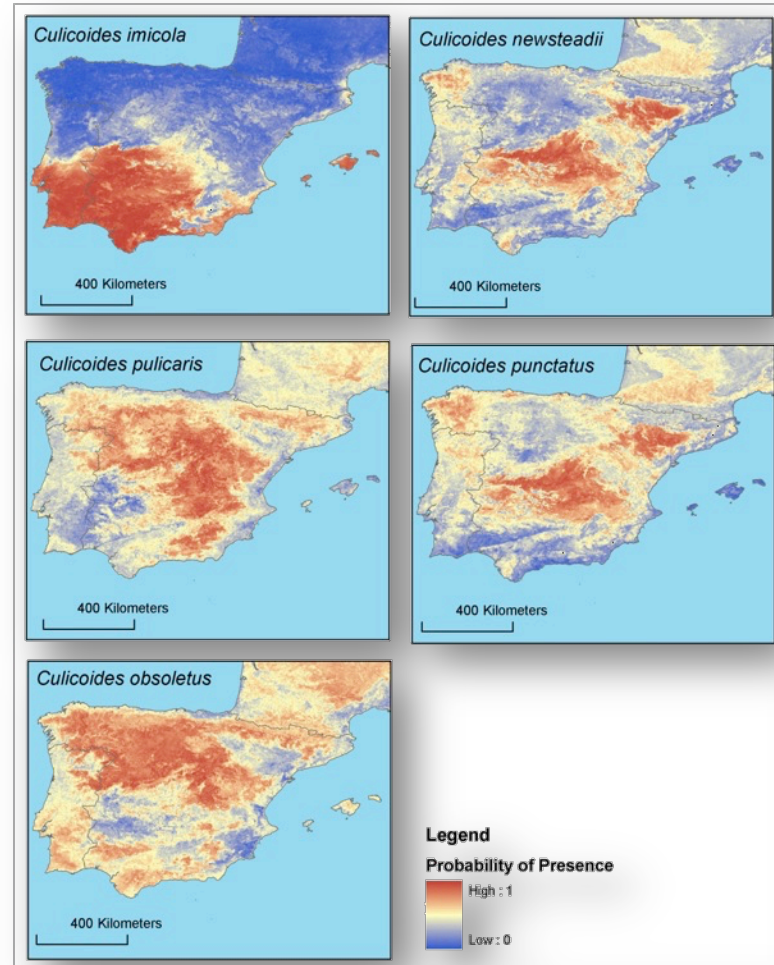
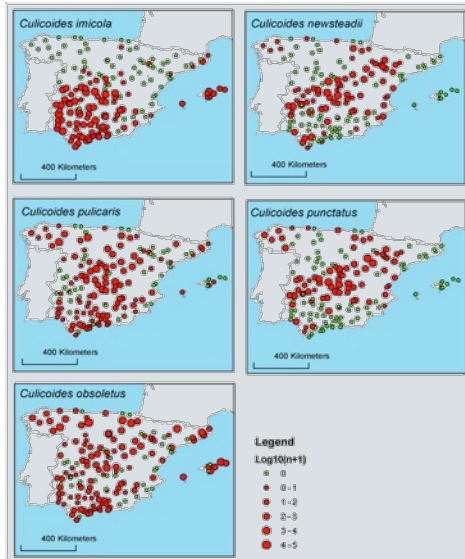
- **e.g. Consultancies**
  - Model the distribution and abundance of mosquito vectors of [Rift Valley Fever](#) in EU as part of spatial risk assessment (EFSA).
  - Model the distribution and abundance of [culicoides](#) in NL and ES (CVI) and EU (DTU), as input for spatial CBD risk assessment (CVI).
  - Monitoring and control of [Ae japonicus](#), an invasive mosquito species, in Natoye, BE (RW).
- **e.g. Contribution to networks & research projects**
  - Spatial distribution models for VBORNET to [identify gaps in maps](#) of mosquitoes, ticks and sand flies in Europe (ECDC).
  - [Surveys](#) to map and model mosquitoes in Senegal, Mauritania, Morocco and Tunisia as part of VMERGE (FP7).
- **e.g. On demand information systems**
  - ENTOMATIC: Monitoring olive fly (Olive Oil Industry)
  - LymeMAP: Monitoring ticks and Lyme disease (ESA)

# RVF in Europe

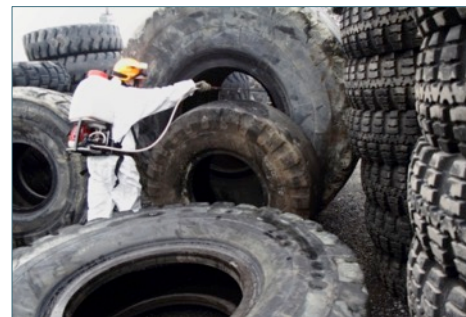
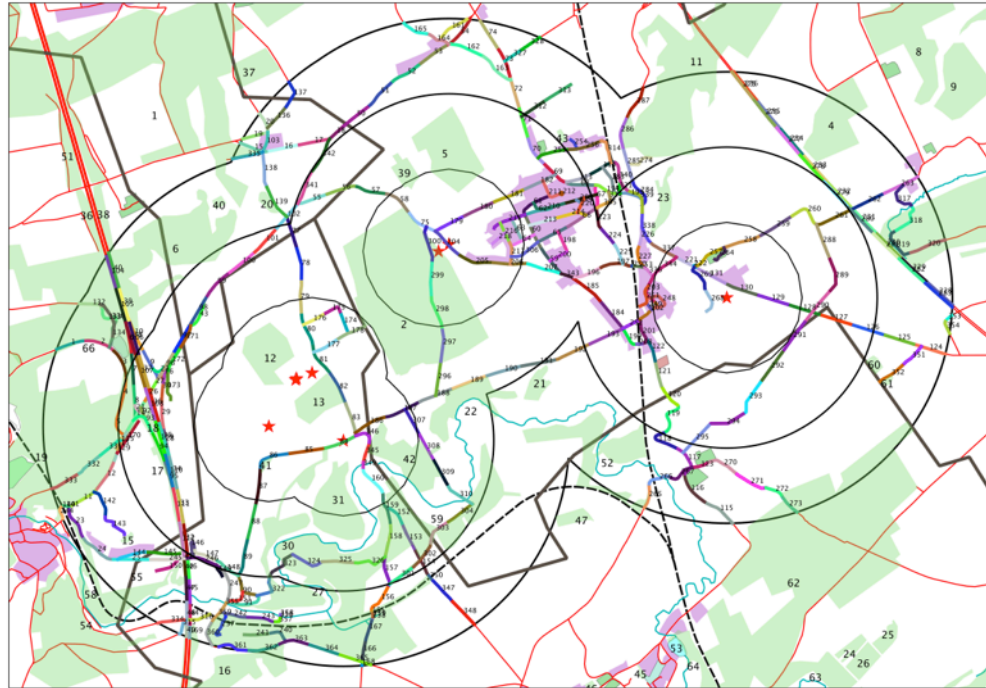




# Culicoides in Spain



# *Ae. japonicus* in Belgium



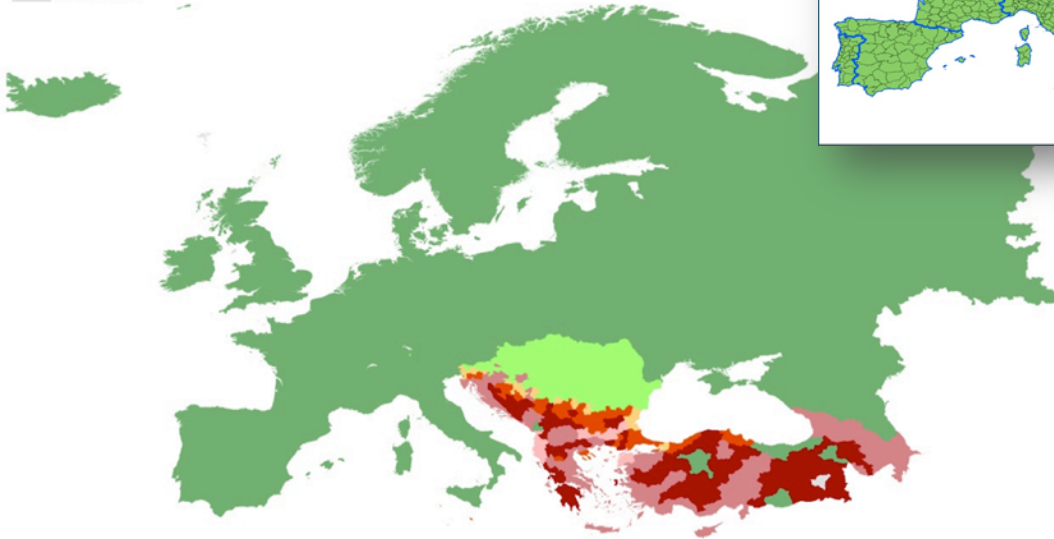
# GAP analysis Phlebotomines EU



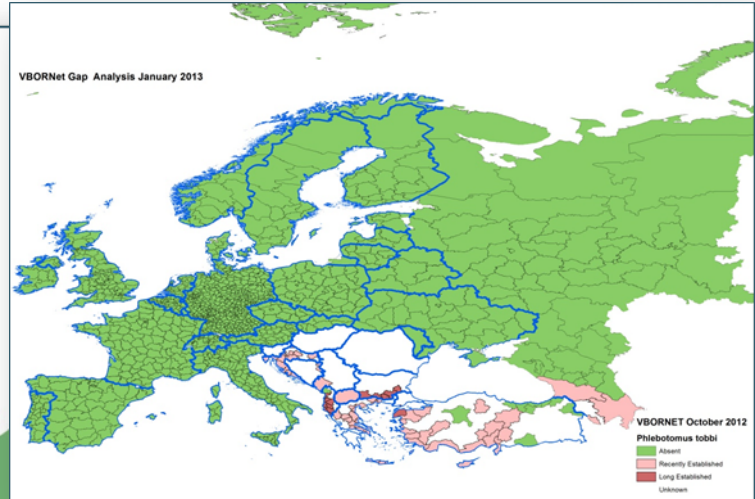
VBORNET GAP ANALYSIS, January 2013

**Phlebotomus tobbi**

- Known Absent
- Known Recently Established
- Known Long Established
- Predicted High Risk
- Predicted Medium Risk
- Predicted Low Risk
- Predicted Minimal Risk
- No Prediction



VBORNet Gap Analysis January 2013



VBORNET October 2012  
**Phlebotomus tobbi**  
Known Absent  
Known Recently Established  
Known Long Established  
Unknown



# Vmerge mosquito mapping

