Inra's input to the *Xylella* crisis

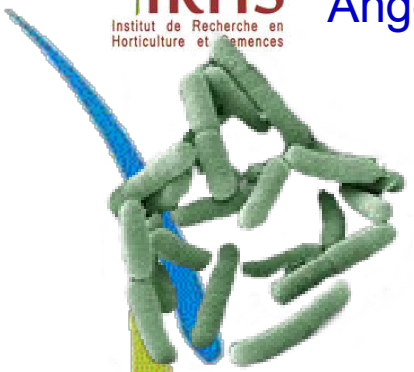
Research and possible solutions

Research at INRA on *Xylella* and its vectors

Characterization
Genomic, Traits,
Parthogenicity

IRHS Institut de Recherche en Horticulture et Semences

Angers



6 researchers
2 PHDs
2 post doc
4 Research officers
7 technicians

Modelling
Epidemiology

Biostatistique BIOSP & Processus Spatiaux

Avignon

agap

CBGP

Montpellier

Vectors
Characterization
Ecology Modelling

Funding

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XF ACTORS

Xylella Fastidiosa Active Containment Through a multidisciplinary-Oriented Research Strategy

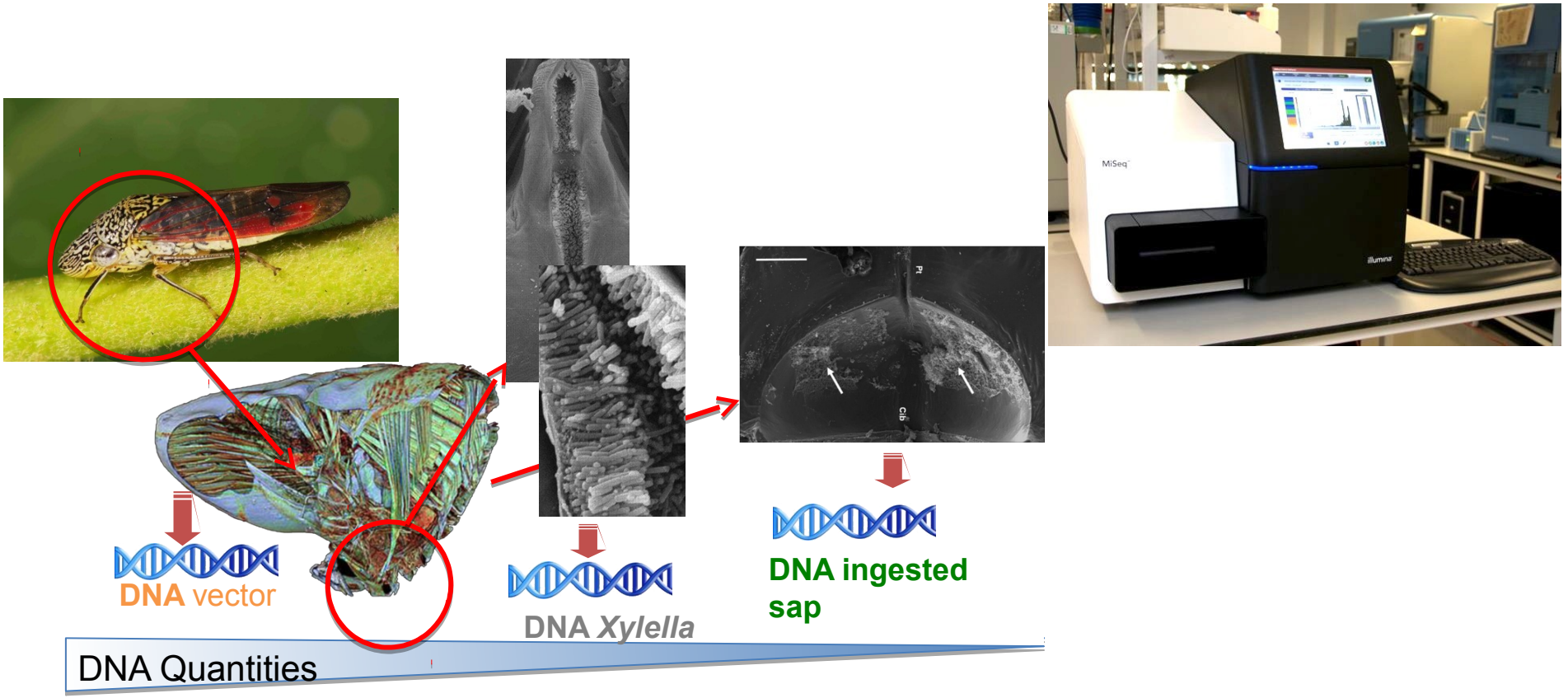
Euphresco

POnTE PestOrganisms ThreateningEurope

Collectivité Territoriale de CORSE Cullettività Territuriale di CORSICA

New detection tools

High performance molecular tools to simultaneously sequence markers for the identification of vectors + plants they fed on + Xf strains



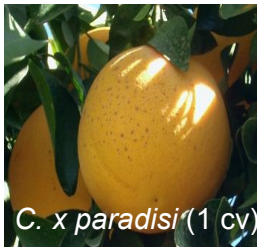
Host range of *X. fastidiosa* strains present in France

Indicator species (Cv.) used as positive controls

Plants of interest for the Loire Valley


M. domestica (2 cv)

for the Mediterranean area



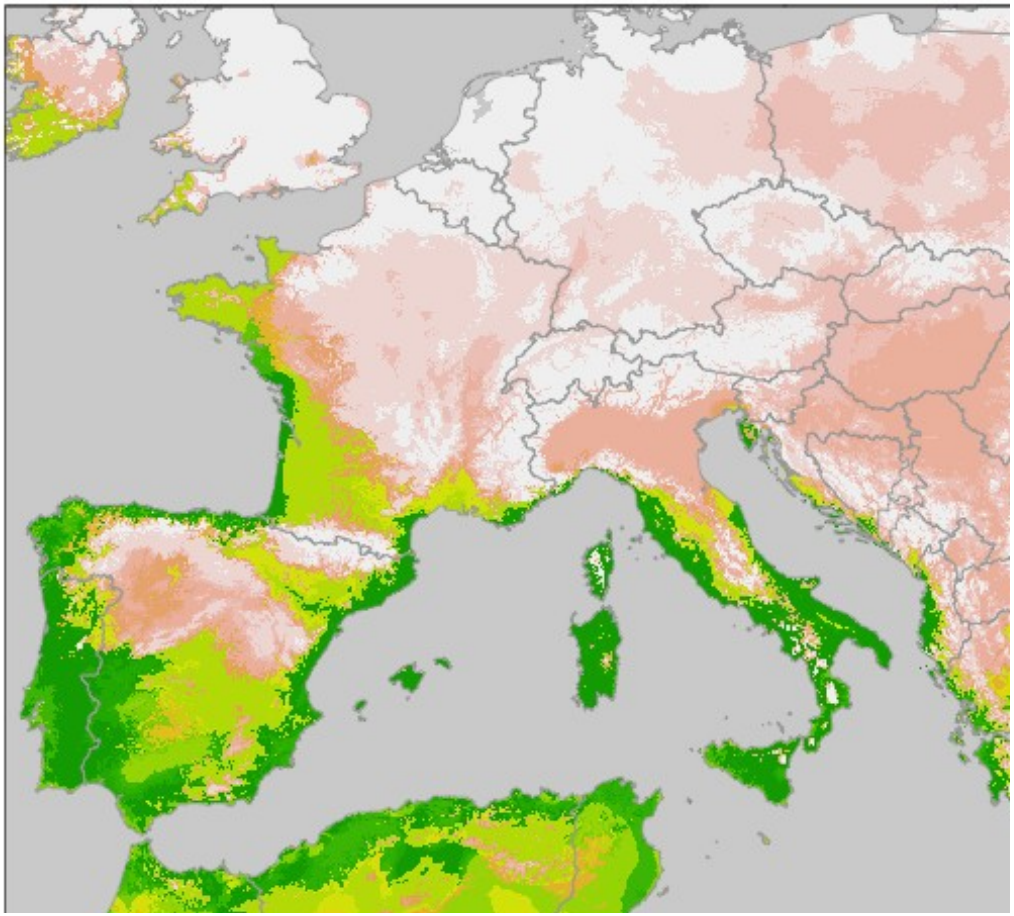
- **Confined S3 chambers**
- Duration**: 8 to 18 months**
- **7 strains** from the 4 major subsp: *fastidiosa, multiplex, pauca, sandyi*

Risk assessment : species distribution models

Today

potential distribution of the bacterium and its vectors here based on *Xf multiplex* data
→ risk assessment
→ sampling schemes
→ zones at risk

simultaneous analysis of the outputs of **21 models**

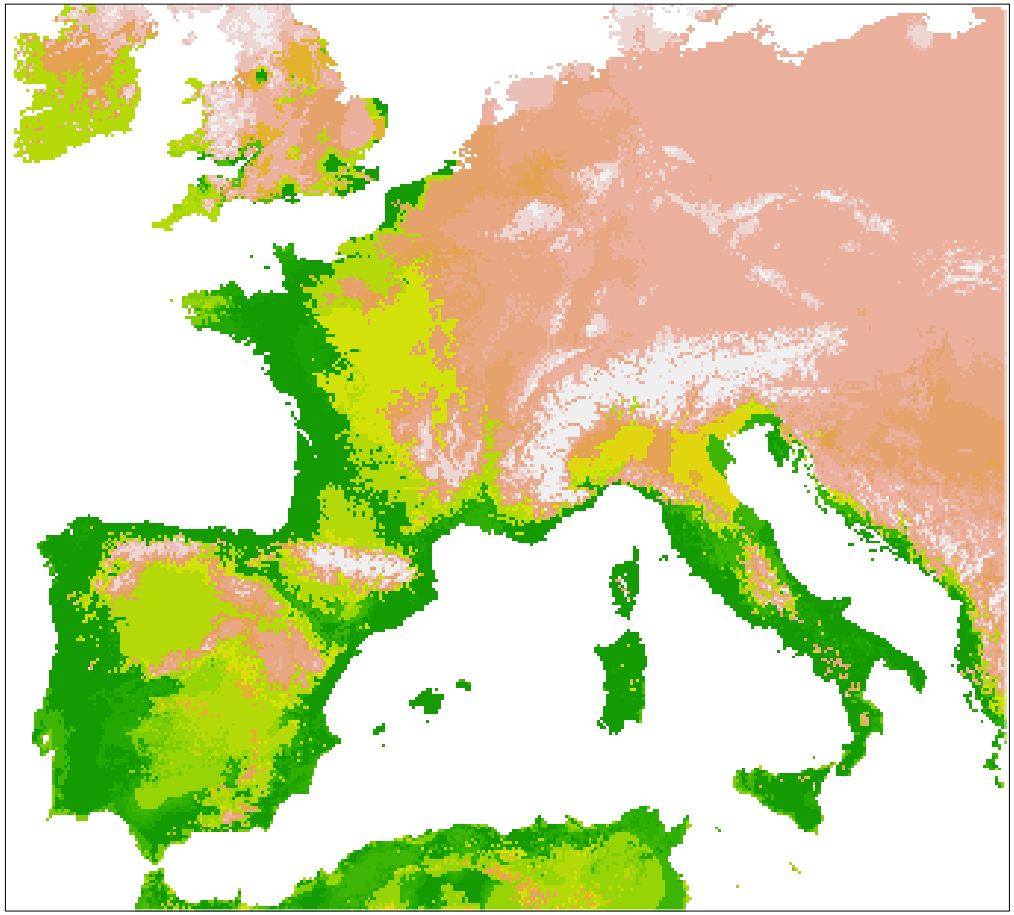


Xylella fastidiosa subsp. ***multiplex***

Risk assessment : species distribution models

2050

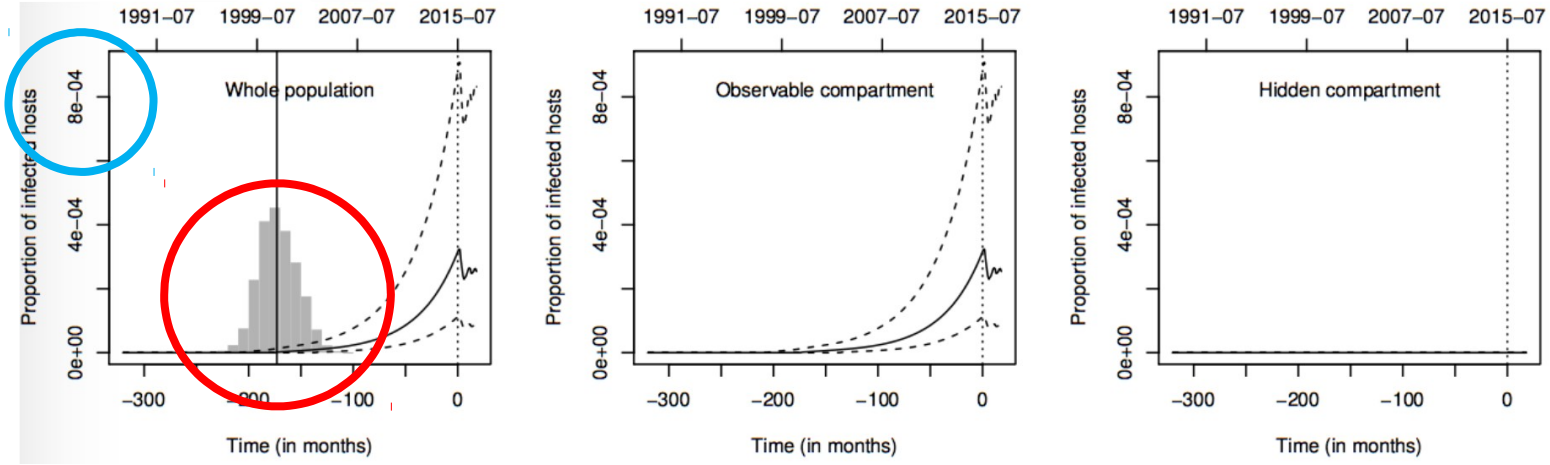
same map coupled with climate change model (Model MIROC5 scenario 4.5 = moderate future greenhouse gas emissions)



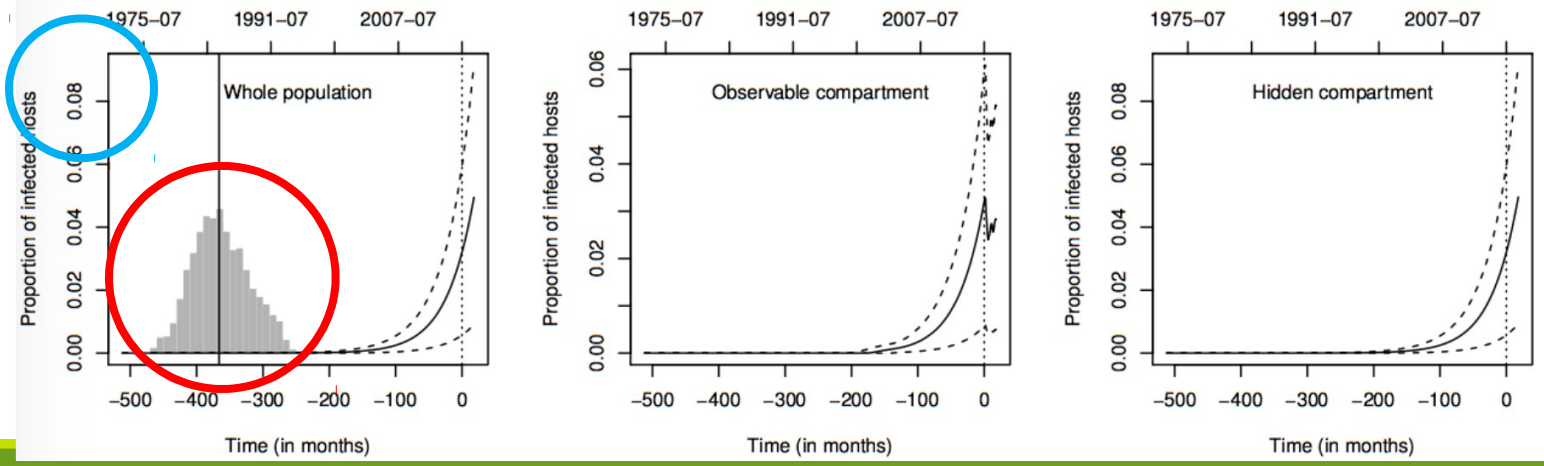
Xylella fastidiosa subsp. ***multiplex***

Epidemic models : suggest a hidden compartment

1- **without hidden compartment** : introduction **2001** (1985-2005) + low prevalence



2- **with hidden compartment** : introduction **1985** (1978-1993) + high prevalence



- hidden compartment hypothesis
- large potential habitat

eradication is not possible in the presence of an already established reservoir

we need to develop :

- local prophylactic practices
- large-scale risk assessment

Eco-epidemiology of Xf in Corsica

Coordinator : Office de l'Environnement de la Corse
Lead scientist J.-Y. Rasplus
Scientific committee : University Corsica, INRA, Corsica Botanical conservatory

Task 1. vectors of Xf in Corsica

Coord.
J.C. Streito
INRA Montpellier

Participants
JY Rasplus INRA
E. Pierre INRA
M. Chartois INRA CDD
MC. Ruiz OCIC Corte

Deliverables :
1) Web interfaced database
2) Distribution of vectors
3) Phenology
4) Molecular identification
5) Endemism

Task 2. feeding plants

Coord.
L. Hugot
CNBC Corte

Participants
C. Panaiotis CBNC
P. Spinosi CBNC
I. Quiquerez CBNC CDD

Deliverables :
1) Web interfaced database
2) Tools for the identification of sap ingested by insectes
3) Endemism, corsican heritage
4) Distribution of plants

Task 3. Interactions plants – Xf -vectors

Coord.
M. Gibernau
Univ. Corse

Participants
A. Cruaud INRA
S. Santoni INRA
PostDoc. J. Albre Uni Corte
CDD DGAL. A.A. Gonzalez

Deliverables :
1) Description of the networks of interactions
2) Behavioral ecology of insects through chemical ecology
3) Identification of chemicals emitted by plants (control the spread of Xf)

Task 4. Risk assesment

Coord.
JP Rossi
INRA Montpellier

Participants
M. Chartois INRA CDD
CDD DGAL. M. Godefroid

Deliverables :
1) Occurrence of the disease in Corsica
2) Prediction in a context of global change

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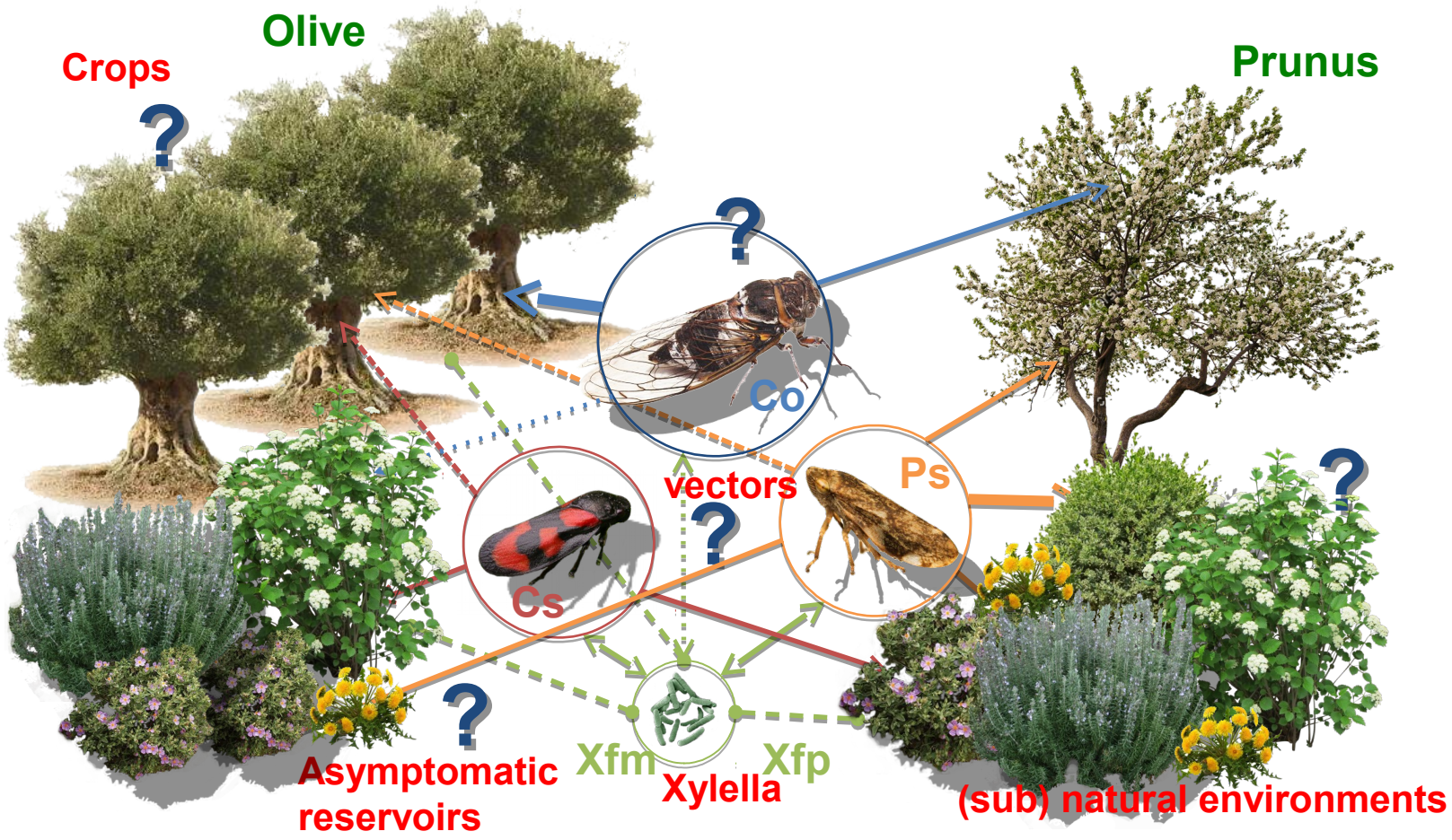
Ecological network : plants - vectors - bacteria



Deciphering ecological interactions using high-throughput molecular tools to develop strategies for disease management (→ **prophylactic practices**).

“Spy insects" approach in Corsica

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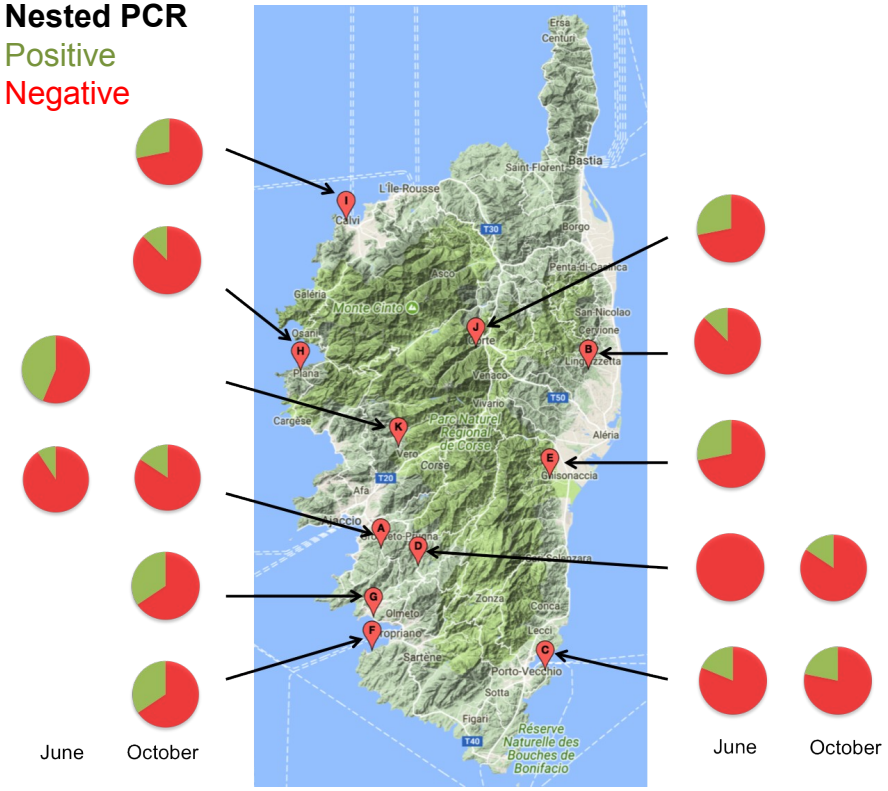
Xylella Fastidiosa Active Containment Through a multidisciplinary-Oriented Research Strategy



Sampling without *a priori* using the most abundant vector *Philaenus spumarius*

insects used as sentinels to monitor Xf populations

→ general overview of Xf population
→ potential risk for plants

faster and easier than plant sampling and testing

“Spy insects" approach - generalization

- use of insects as "sentinels" for Xf local prevalence
- need of collaborative European network using spy insects to assess Xf diversity and distribution in Europe

Geographical distribution of *Philaenus spumarius*