Metaprogram
BIOSEFAIR

FARMSOUND

PATHFINDER PROJECT

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Keywords
Biodiversity
Bird communities
Ecoacoustics
Organic farming
Soundscapes

Thematics involved
Agro-ecology
Bioacoustics
Biogeography
Landscape ecology
Community ecology
Historical ecology
Ethno-ecology
Human geography
Geomatics
Deep learning
Modelling
Teledetection

Departments involved
ACT
AgroEcoSystem
AQUA
ECODIV
SPE

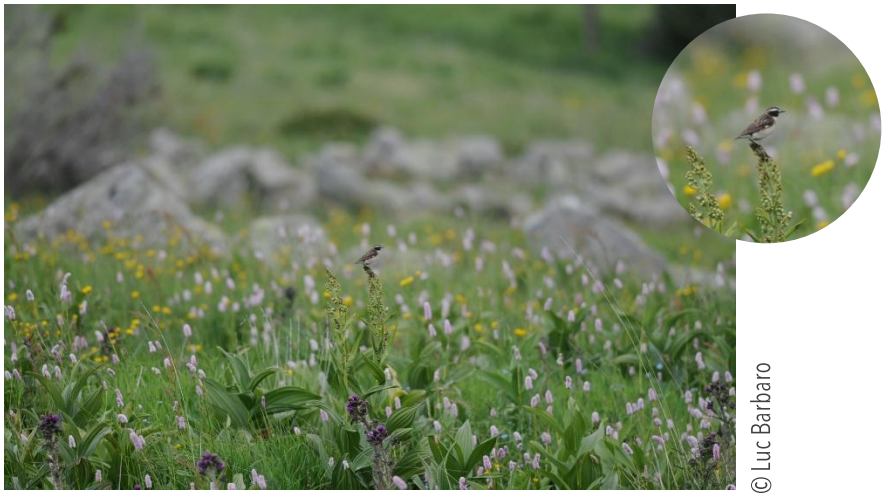
Units involved
UMR DYNAFOR
UMR BAGAP
UR PSH
UREP
UMR SAVE
UMR LISAH

Partners
SETE - CNRS
OFB
University of Caen Normandie
UMR Chrono-environnement - CNRS / University Marie et Louis Pasteur
University of Helsinki (Finlande)

A multiregional network of acoustic biodiversity monitoring in French farmland soundscapes

Backgrounds and challenges

The FARMSOUND project aims at (1) federating a scientific network for monitoring rural acoustic landscapes in France and their acoustic biodiversity; (2) jointly analyzing the factors determining their acoustic diversity and the composition of acoustic bird communities; (3) proposing socio-ecological indicators of the cultural value of soundscapes and their acoustic diversity. FARMSOUND will test the hypothesis of positive responses of acoustic biodiversity to the level of landscape naturalness and diversity of agricultural management intensity, and in particular to the current and historical amount and configuration of permanent grasslands and the proportion of organically farmed plots at the landscape scale.



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Objectives

FARMSOUND aims at providing an integrative, non-invasive and innovative method for monitoring the biodiversity of French rural landscapes composed of mosaics of crops, meadows and forests, taking into account both their wide inter-regional diversity and their strong intra-regional heterogeneity. In response, we are developing new socio-ecological indicators based on the acoustic diversity of soundscapes recorded by passive automatic recorders. Acoustic indices calculated from sonograms can be used to characterize the overall acoustic diversity and complexity of a soundscape. They also make it possible to quantify the relative proportions of phonies (i.e., biophony, geophony or techno-anthropophony) and their co-occurrence in a rigorous, standardized, repeatable and non-invasive way. Systematic identification of acoustic bird communities using deep learning algorithms will also be carried out during the 2d year of the project. FARMSOUND is based on a network of sites recorded by passive acoustics at a dozen workshop sites in 8 French regions, using standard recorders. The acoustic data acquired at these sites (roughly N = 500 soundscapes expected to be recorded at the end of the project) will be used to test the effect of the composition and current and past configuration of rural landscapes on their current acoustic diversity and communities, as well as the effect of the intensity of agricultural practices (including the proportion of organic farming) and the level of surrounding landscape naturalness.

Approaches

The questions and approaches of FARMSOUND are structured into a main task of modeling the response of acoustic indices to the structure and management intensity of current agricultural landscapes and three additional inter-disciplinary tasks:

1) What is the effect of the historical amount of permanent grassland in the landscape on current acoustic diversities and communities? Has compositional and configurational heterogeneity changed since the immediate post-war period? Is there a link between landscape changes and trends in the evolution of key songbird species in agricultural landscapes over recent decades?

2) How can we optimize the use of algorithms for automated recognition of species vocalizations and various sound sources, whether biophonic, geophonic or techno-anthropophonic? Can we characterize bird 'acoustic communities' in a standardized way, and how can we define this new concept of community compared to the one used for decades in community ecology?
3) Is acoustic diversity a good indicator of the sound quality of agricultural landscapes? Can we link a perception of acoustic well-being with the composition and richness of bird communities in a soundscape? Can we estimate the cultural value of bird songs at the community level, and is there a link between the acoustic traits of bird songs and their contribution to the cultural diversity of songs?