Article eco-acoustique

Acoustic pollinator detection to measure the pollination activity

Abstract

Introduction

Service pol essential

Nécessité de le mesurer

Découle de l’activité des pol

We compared different methods of automatic acoustic detection to show the best method to detect automatically pollinators during their flying in limiting the error rate.

Material & Methods

Site description

We worked in the Long-Term Social-Ecological Research site “Zone Atelier Plaine et Val de Sèvre” located in South-West France. This site was an area of 435 km², on which 87% was cultivated and it was splitting in 13000 fields (REF: Bretagnolle et al., 2018). This site was dominated by cereals (Valeur en 2020) and sunflower represented (Valeur en 2020) of the cultivated area.

30 sunflower fields were selected according to landscape gradients (coverage of meadows, hedgerows, tillage, semi-natural habitats and organic farmland) which were calculated within a 1km radius of the field's centroid. It was also ensured that the flowering of these fields were not simultaneous in order to be able to monitor the entire flowering period of the crop. 11 of these fields were cultivated organically.

Recording method

In each field, we placed an audiomoth(REF), which is a microphone (see …. For the description and parameters), between 10 to 20cm in front of a sunflower plant situated at approximately 20m of the edge. The audiomoth were covered by a windscreen to reduce the sound of wind. We made recordings between 6 am to 10 pm.

Focal

To calibrate the acoustic method, It was necessary that we know some recordings in which insects had come. For this, we coupled the audio recordings with the observation. The observatory was placed at more than 50 centimeters of the plant in front of the capitulum. During five minutes, every 15 seconds, each insect close to the sunflower plant was noted. For each insect, its guild (honey bee, Bombus, other wild bee, hoverfly, other Diptera, Coleoptera, other), its position (on male flowers, on female flowers, around the capitulum, on weeds, around weeds) were noted. These observations were repeated 3 times per week before, during and after the flowering period of the capitulum in each field. During a week, one of the observations observation was made one in the morning, one in the middle of the day and one at the end of the day. We had a total of 291 observation coupled with audio-recording.

(Si besoin on peut ajouter météo et nectar)

Recordings treatment

To analyze our recordings, it was necessary to apply on them a pretreatment. The first step of this was to cut in more little recordings of 10 sec. To made this, we used the Kaleidoscope(REF) software. Next, it was necessary to increase the time/frequency ratio. For this, we accelerated all recordings by 10 times.

A reference database building

12 focales étiquetées dès qu’on savait à quoi correspondait l’évènement sonore

Grâce à première base de ref, classifier a tourné sur 10% données hors focales et sélection aléatoire stratifiée pour augmenter data base

Classifier testings

Results

Discussion