

Journée des non permanents

Demo-genetic approach to identify the environmental conditions favourable to the maintenance of pest populations in an area outside the growing season



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Moi / Me

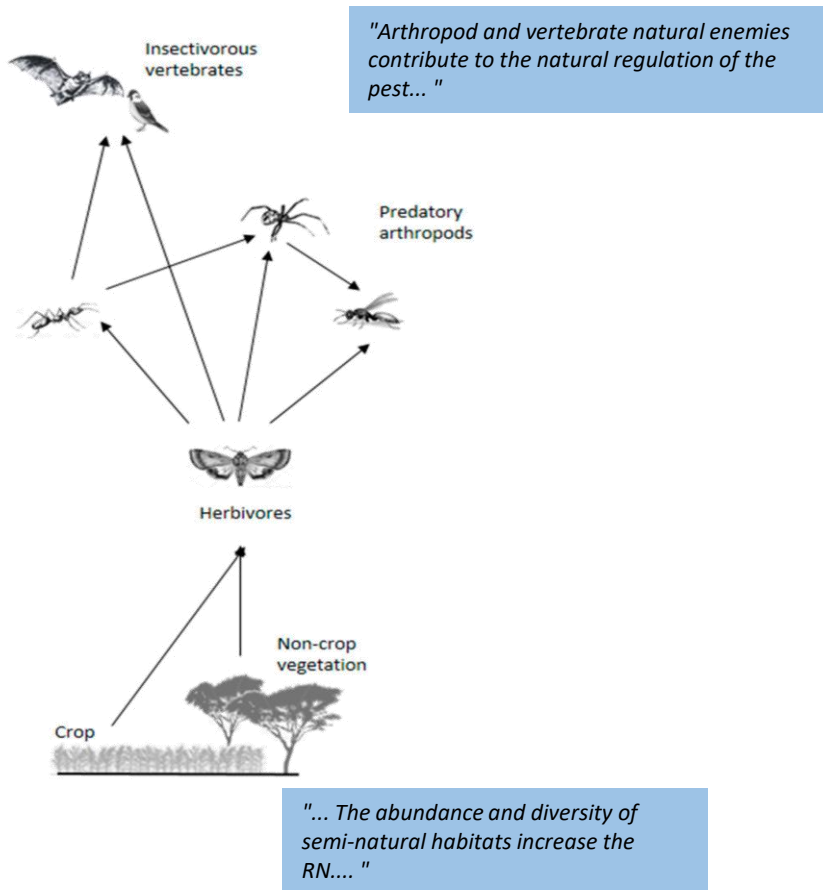
Senegal



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2019 - Thesis. UCAD

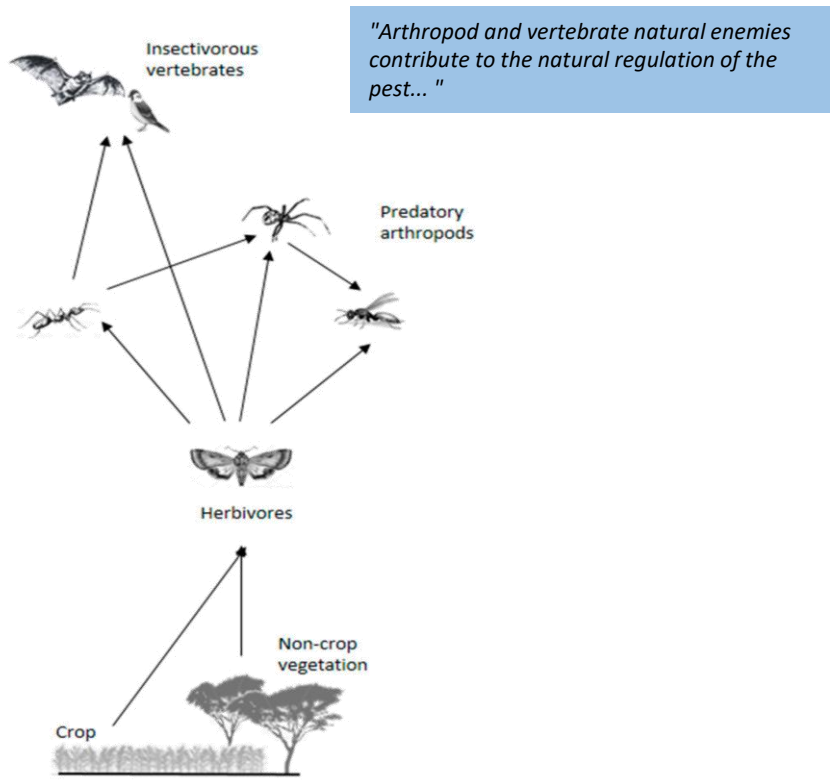
Molecular and ecological approach for the evaluation of natural regulation processes of the millet ear leaf miner, *Heliocheilus albipunctella*, in the groundnut basin of Senegal.



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"Arthropod and vertebrate natural enemies contribute to the natural regulation of the pest..."

"... The abundance and diversity of semi-natural habitats increase the RN.... "

insects MDPI

Article
DNA Metabarcoding as a Tool for Disentangling Food Webs in Agroecosystems
 Ahmadou Sow ^{1,*}, Julien Haran ^{2,3}, Laure Benoit ^{2,3}, Maxime Galan ^{3,4} and Thierry Brevault ^{3,4}

SCIENTIFIC REPORTS

OPEN **Deciphering host-parasitoid interactions and parasitism rates of crop pests using DNA metabarcoding**

Received: 14 August 2019
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 Published online: 06 March 2020

Ahmadou Sow ^{1,2}, Thierry Brevault ^{3,4,5}, Laure Benoit ^{3,4}, Marie-Pierre Chapuis ^{1,6}, Maxime Galan ^{3,4}, Armelle Coeur d'Acier ^{3,4}, Gérard Delvare ^{3,4}, Mbacke Sambène ^{1,7,8}

Contents lists available at [ScienceDirect](#)
Biological Control
 journal homepage: www.elsevier.com/locate/ybcon

DNA sequencing to help identify agro-ecosystems: The case of the (Lepidoptera: Noctuidae) in sub-Saharan Africa
 Ahmadou Sow ^{1,2}, Thierry Brevault ^{3,4,5}, Armelle Coeur d'Acier ^{3,4}, Maxime Galan ^{3,4}, Marie-Pierre Chapuis ^{1,6}, Gérard Delvare ^{3,4}, Mbacke Sambène ^{1,7,8}

GfÖ
 GfÖ Ecological Society of Germany, Austria and Switzerland
 Basic and Applied Ecology 64 (2022) 45–56

Basic and Applied Ecology
www.elsevier.com/locate/bae

RESEARCH PAPER
Non-crop habitats concurrently drive crop colonization by the millet head miner and contribute to natural regulation

Crop Protection 132 (2020) 109127

Contents lists available at [ScienceDirect](#)
Crop Protection
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Birds and bats contribute to natural regulation of the millet head miner in tree-crop agroforestry systems
 Ahmadou Sow ^{1,2}, Djiby Seye ³, Emille Faye ^{3,4,5}, Laure Benoit ^{3,4}, Maxime Galan ^{3,4}, Julien Haran ^{2,3}, Thierry Brevault ^{3,4}

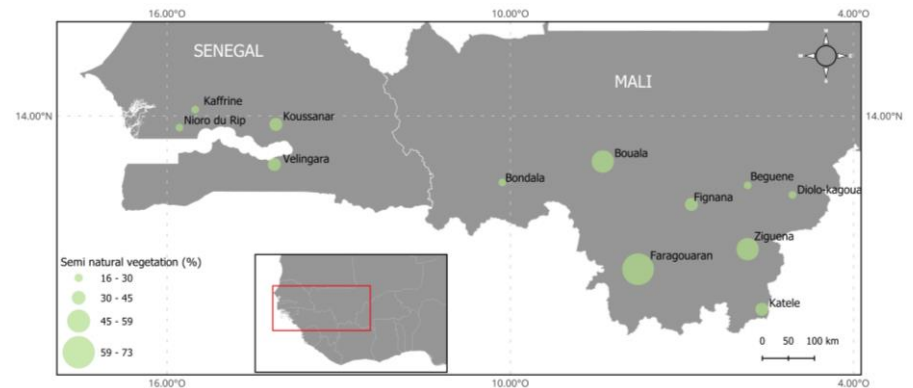
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2020 - Postdoc. CIRAD (France)

Large-scale diagnosis of the incidence of the fall armyworm, *Spodoptera frugiperda* (J.E. Smith), in Senegal and Mali.



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Diagnostic multi-échelle de l'incidence de la chenille légionnaire d'automne, *Spodoptera frugiperda* (J.E. Smith), au Sénégal et Mali».

2023 - Postdoc. ISRA (Senegal) – ZALF (Germany)

Effect of landscape context and climatic factors on the incidence of millet head miner and its natural regulation, at regional level in Senegal



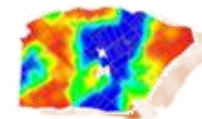
Deutscher Akademischer Austauschdienst
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Leibniz Centre for
Agricultural Landscape Research
(ZALF)

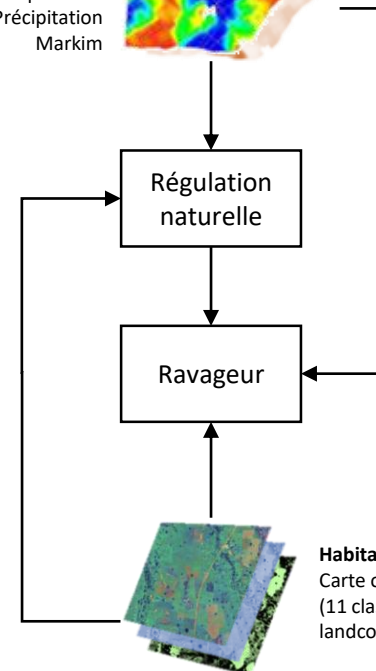
Conditions climatiques

Température
Précipitation
Markim



Régulation
naturelle

Ravageur



Habitats semi-naturels
Carte occupation du sol
(11 classes) - ESA
landcover map (10-m)

Moi / Me

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2023 - Postdoc. ISRA (Senegal) – ZALF (Germany)

Effet du contexte paysager et des facteurs climatiques sur l'incidence de la mineuse de l'épi de mil (MEM) et de sa régulation naturelle, à l'échelle régionale au Sénégal

2024 - Postdoc. CBGP – Univ. Montpellier (France)

Demo-genetic approach to identify the environmental conditions favourable to the maintenance of pest populations in an area outside the growing season

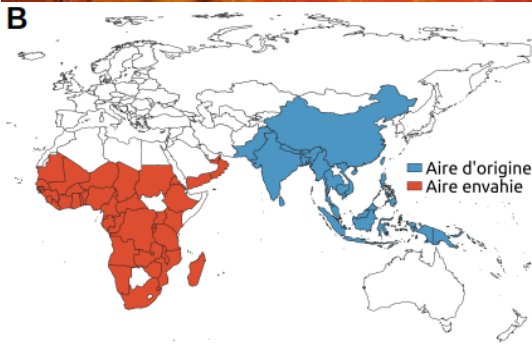
Inferring pest DISpersal in agricultural LANDscapes to improve management strategies (ANR DISLAND, 2021-2026).



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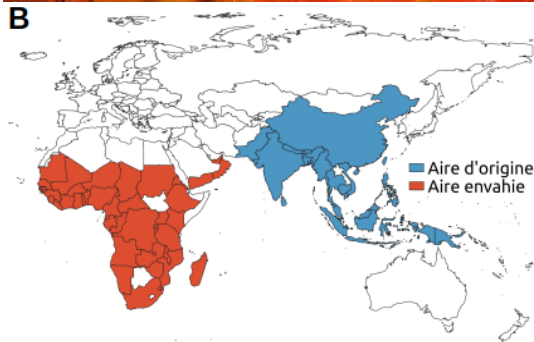
Oriental fruit fly, *Bactrocera dorsalis* (Diptera, Tephritidae)



- Main pest for horticultural crops in Africa (Mutamiswa et al. 2021)
- Polyphagous
- Mutivoline
- Wide dispersal

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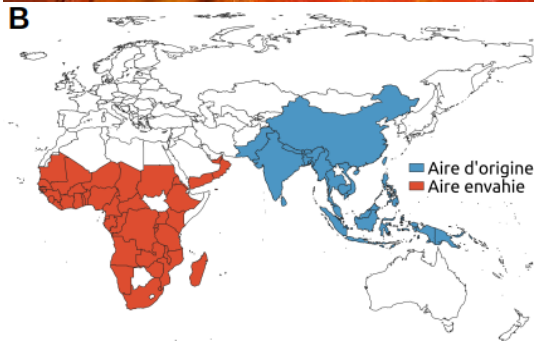
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- 60 % direct yield loss in Casamance (N'diaye et al. 2012)

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Oriental fruit fly, *Bactrocera dorsalis* (Diptera, Tephritidae)



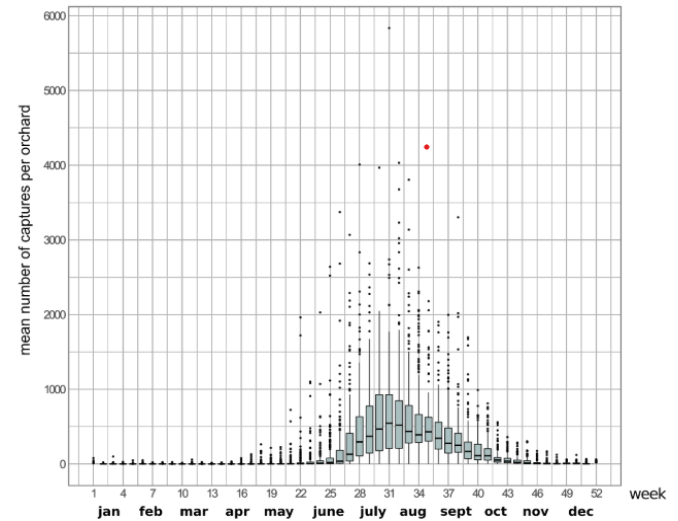
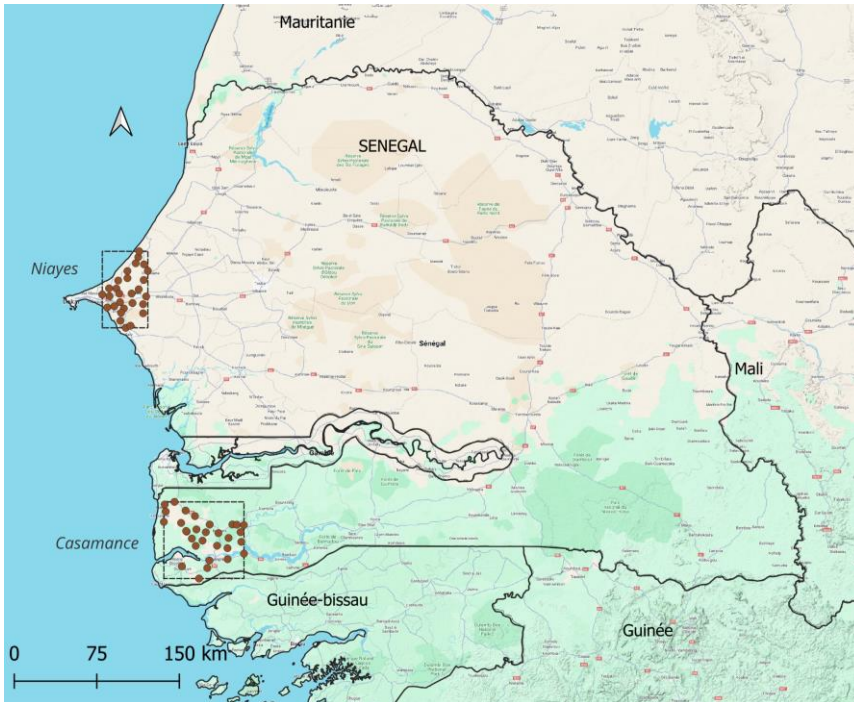
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- Pest management by using natural enemies.

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Inferring pest DISpersal in agricultural LANDscapes to improve management strategies (ANR DISLAND, 2021-2026).



Dynamique annuelle des population de BD dans les bassins de production au Sénégal (Niaye). (Caumette et al. 2023)

- 56 orchards in two basins
- Two-years longitudinal survey

“An annual dynamic marked by two phases: re-infestation and population decline...”

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Main research question

What environmental conditions support the maintenance of residual populations of *B. dorsalis* in dry periods at regional scale?

Mon projet / my project

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What environmental conditions support the maintenance of residual populations of *B. dorsalis* in dry periods ?

Hypothesis 1. Availability of alternative hosts for reproduction (Ekesi et al. 2006)

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Main research question

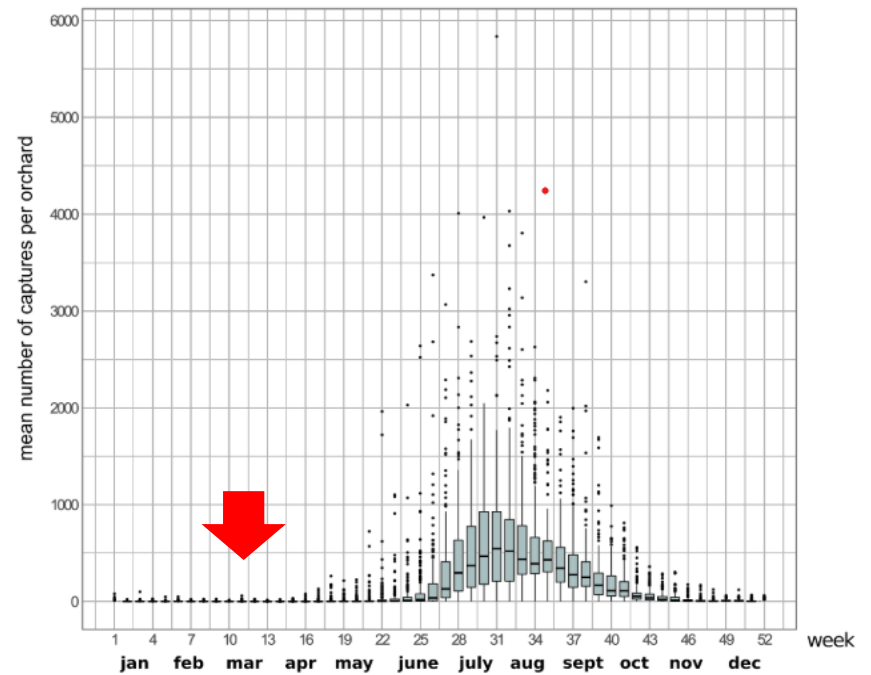
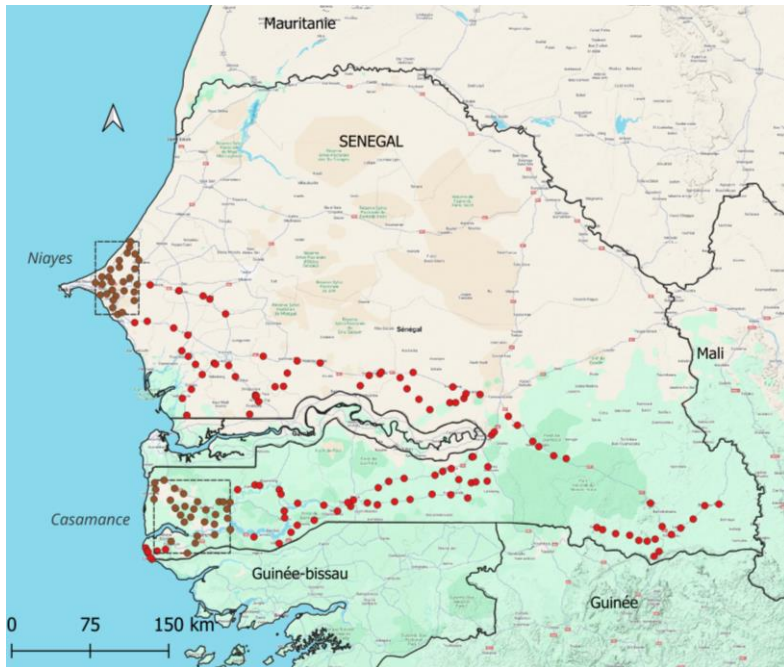
What environmental conditions support the maintenance of residual populations of *B. dorsalis* in dry periods ?

Hypothesis 1. Availability of alternative hosts for reproduction (Ekesi et al. 2006)

Hypothesis 2. Availability of habitats that provide favourable microclimates for their survival (e.g. Temperature, Dongmo et al. 2021)

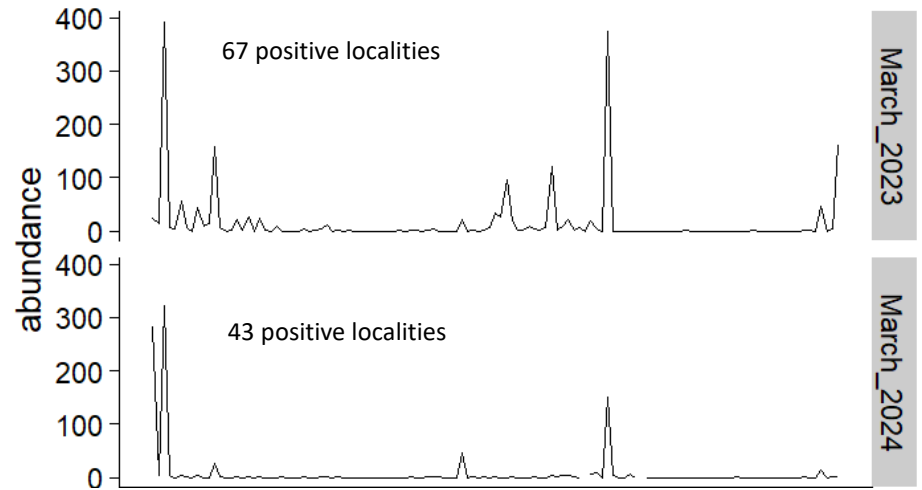
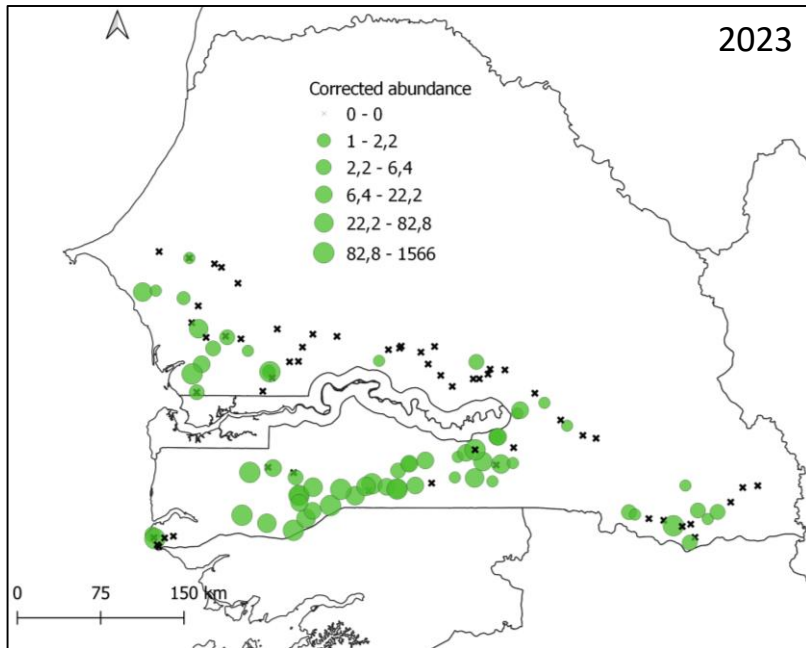
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Two-years snapshot sampling
march 2023 and 2024



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Demography
Corrected abundance



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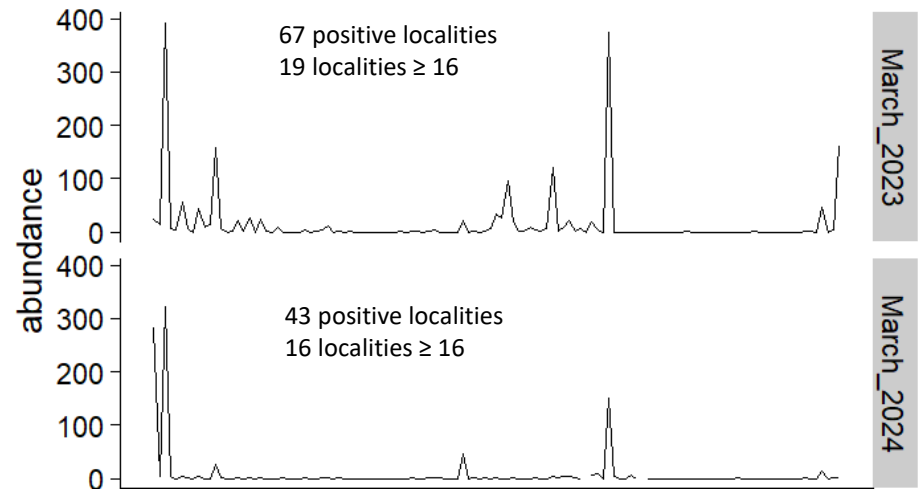
Demography

Corrected abundance



Genetics

Effective pop. size / Diversity index



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Local environment



Permanant Water



Orchard



Canopy



Irrigated crops



Animals



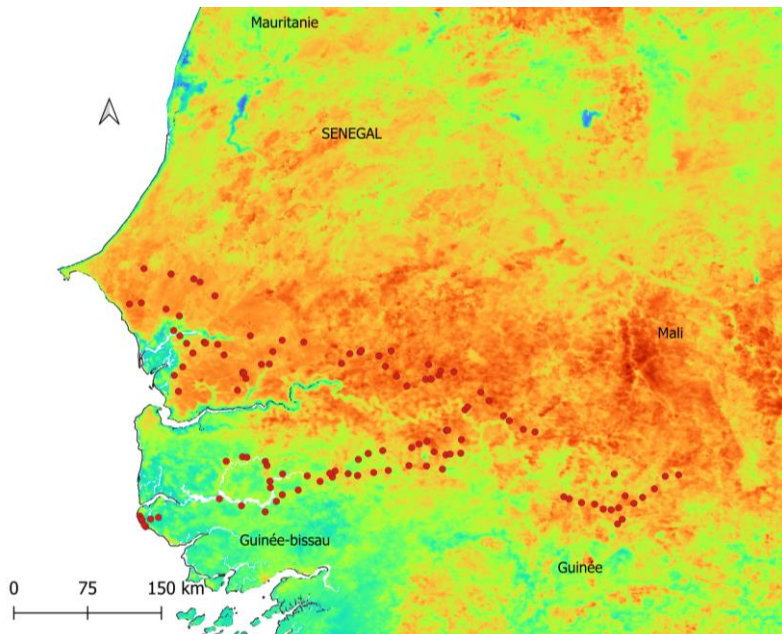
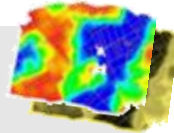
Dry environment



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Climate data

(Temperature, NDWI, rainfall, etc.)

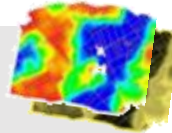


Temperature: MOD11A2 days and night 1-km
NDWI: MOD13Q1 16 days 250-m
LAI: MOD15
Rainfall: TAMSAT

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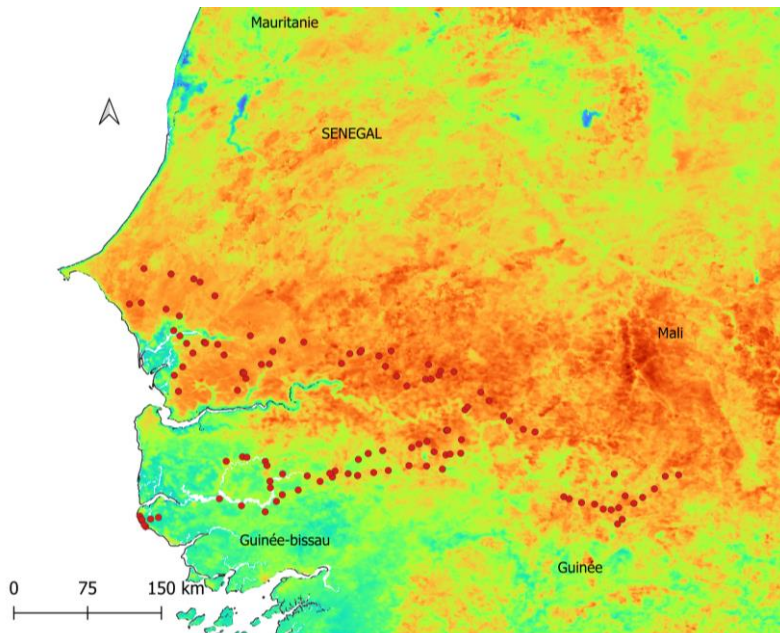
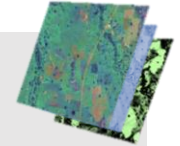
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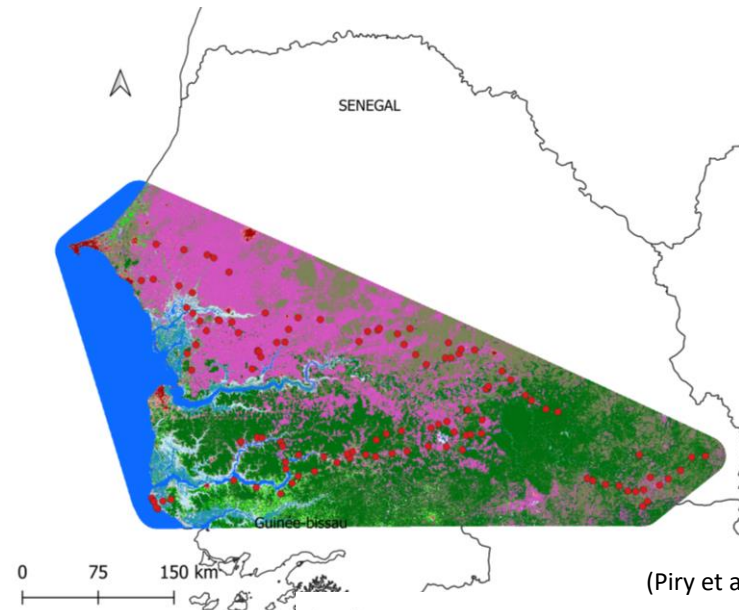


Landcover map

(SNH, crops, etc..)



Temperature: MOD11A2 days and night 1-km
NDWI: MOD13Q1 16 days 250-m
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Rainfall: TAMSAT



(Piry et al. in prep.)

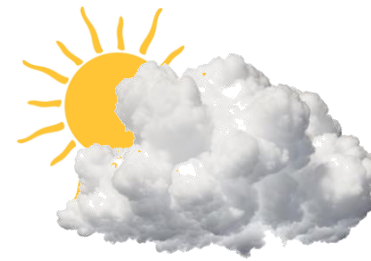
Landcover map

- | | |
|---------------------|--------------------------|
| Lowland crops | Greenhouse |
| Irrigated crops | Sol inondable |
| Annual crops | Dry bare soil |
| Water | Dense urban area |
| Mangrove | diffuse urban area |
| Riz crops | Dense natural vegetation |
| Shrubby savannah | Orchards |
| Herbaceous savannah | Anachard orchards |

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Robust analysis pipeline

- Siland (Carpentier et Martin 2021)
- GPBoot (Sigrist 2022)



Climate

- Temperature
- NDWI
- Rainfall



Pest

- Abundance
- Effective pop. Size / Diversity index



Landscape

Semi-natural habitats

- Rangeland
- Woodland
- Lowland
- Mangrove
- Etc..

Crops

- Orchards
- Annual crops
- Gardens
- Riz fields
- Etc..

Local environment

- Canopy
- Presence of water
- Presence of hosts
- Presence of crops
- Presence of animal droppings
- Etc...

Merci de votre attention !

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