



# TreMs Collect and IBP Collect: two new apps designed for collecting data on tree-related microhabitats (TreMs) and the Index of Biodiversity Potential (IBP)

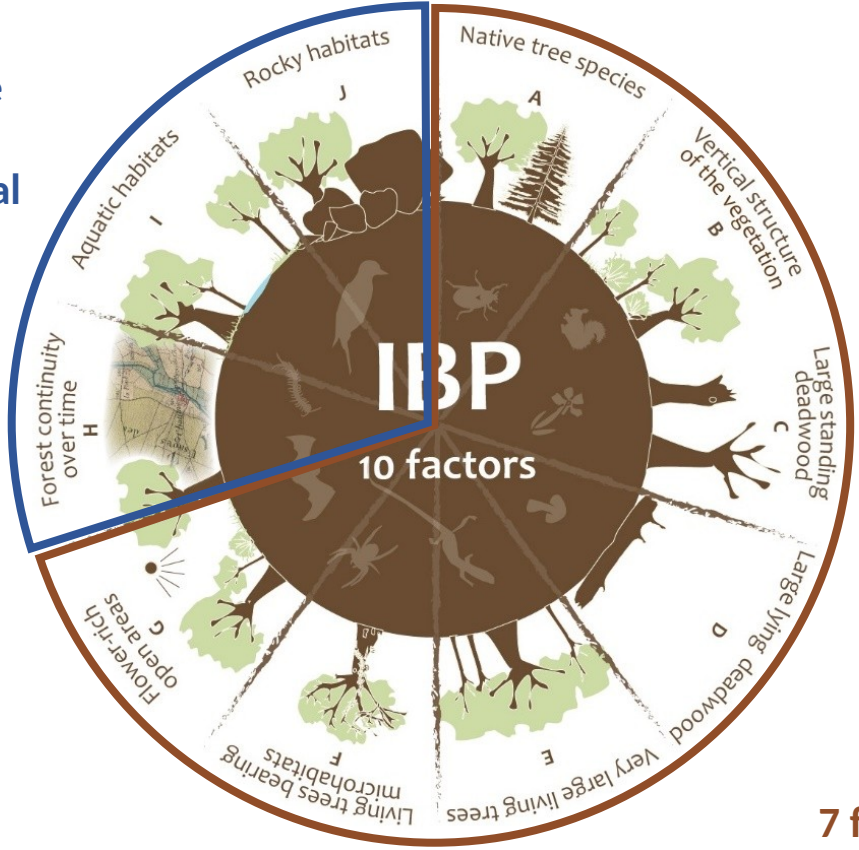
Gouix N.<sup>1,2</sup>, Bossaert M.<sup>1</sup>, Bütler R.<sup>3</sup>, Courbeau B.<sup>4,6</sup>, Emberger C.<sup>1</sup>, Marty P.<sup>7</sup>, Norel H.<sup>1</sup>, Larrieu L.<sup>5,6,7</sup>



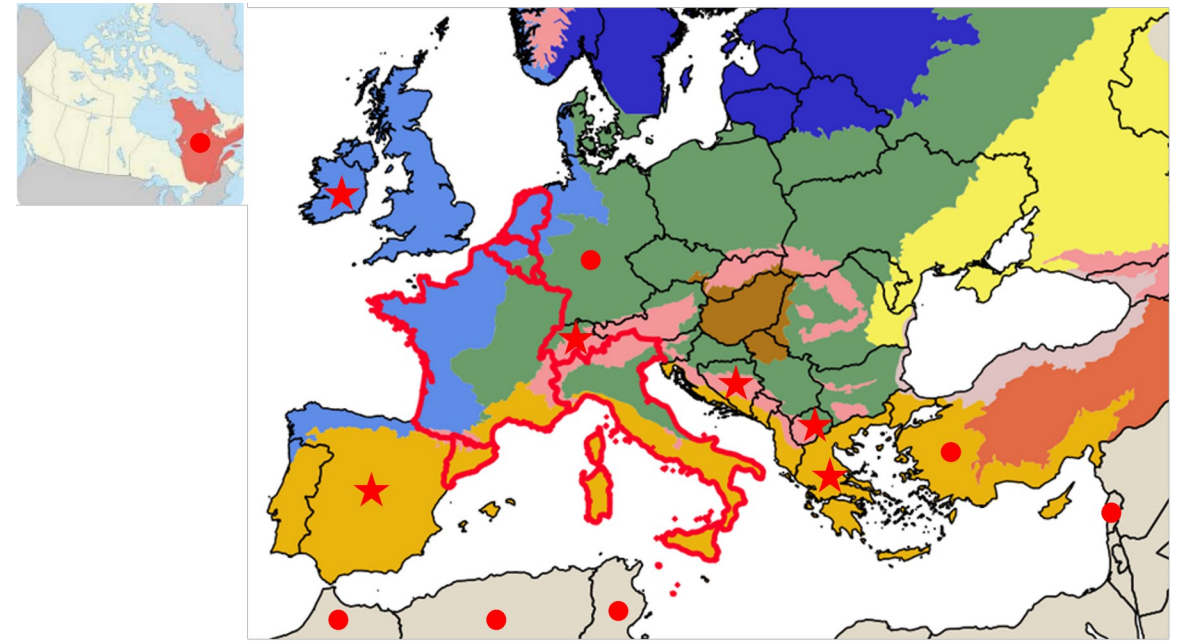


The Index of Biodiversity Potential is a straightforward diagnostic tool designed to assist forest managers in implementing biodiversity-friendly forest management practices

3 factors related to the historical and environmental context



7 factors directly related to forest management

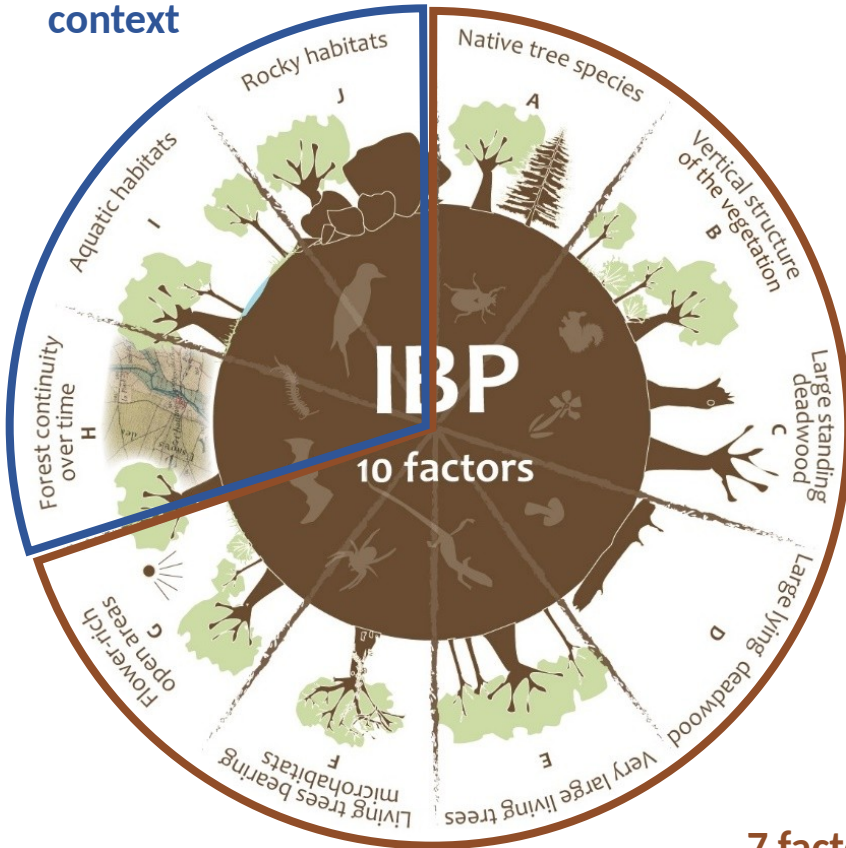


- Already implemented at the country scale (FR, IT, BE, NL, LU, ES Catalonia)
- ★ Version adapted to the country currently being finalized (ES, CH, BA, MK, GR, IE)
- Undergoing testing (QC, DE, TR, LB, TN, DZ, MA)

Commonly used in Europe for biodiversity assessment



3 factors related to the historical and environmental context



7 factors directly related to forest management

Based on a scientific background developed over a 18-y R&D programme



Ecological Indicators  
Volume 136, March 2022, 108692



Index of biodiversity potential (IBP) versus direct species monitoring in temperate forests

Laura Zeller <sup>a</sup>, Charlotte Baumann <sup>a</sup>, Pierre Gonin <sup>b</sup>, Lea Heidrich <sup>c</sup>, Constanze Keye <sup>d</sup>, Felix Konrad <sup>a</sup>, Laurent Larrieu <sup>a,f</sup>, Peter Meyer <sup>d</sup>, Holger Sennhenn-Reulen <sup>g</sup>, Jörg Müller <sup>h,i</sup>, Peter Schall <sup>a</sup>, Christian Ammer <sup>a</sup>



Ecological Indicators  
Volume 104, September 2019, Pages 116-126



Assessing the potential of routine stand variables from multi-taxon data as habitat surrogates in European temperate forests

Laurent Larrieu <sup>a,b</sup>, Frédéric Gosselin <sup>c</sup>, Frédéric Archaux <sup>c</sup>, Richard Chevalier <sup>c</sup>, Gilles Corriol <sup>d</sup>, Emmanuelle Dauffy-Richard <sup>c,l</sup>, Marc Deconchat <sup>a</sup>, Marion Gosselin <sup>c</sup>, Sylvie Ladet <sup>a</sup>, Jean-Marie Savoie <sup>a</sup>, Laurent Tillon <sup>a</sup>, Christophe Bouget <sup>c</sup>



Forest Ecology and Management  
Volume 587, 1 July 2025, 122727



Evaluating habitat structural variables as reliable indicators of biodiversity in Mediterranean forests

Marc Rota <sup>a,b,c</sup>, Míriam Piqué <sup>a,b</sup>, Víctor Sazatornil <sup>a</sup>, Mariano J. Feldman <sup>a</sup>, Teresa Baiges <sup>d</sup>, David Guixé <sup>a</sup>, Laurent Larrieu <sup>a,f</sup>, Roser Mundet <sup>g</sup>, Mar Pallarés <sup>a</sup>, Jordi Vayreda <sup>h</sup>, Jordi Camprodon <sup>a,i</sup>



Ecological Indicators  
Volume 110, March 2020, 105884



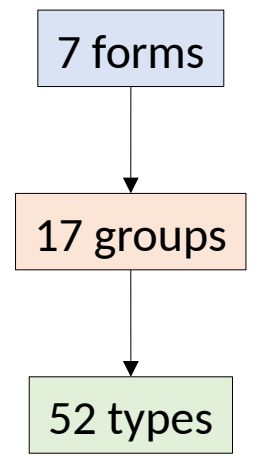
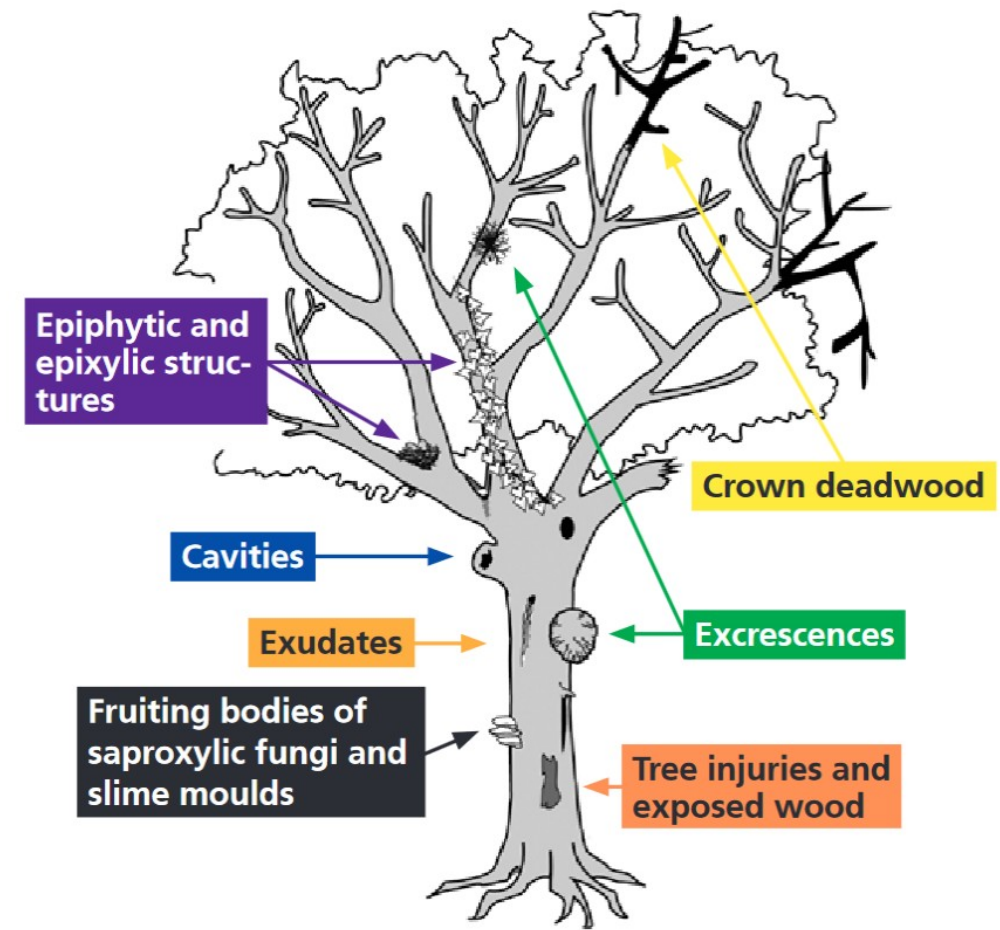
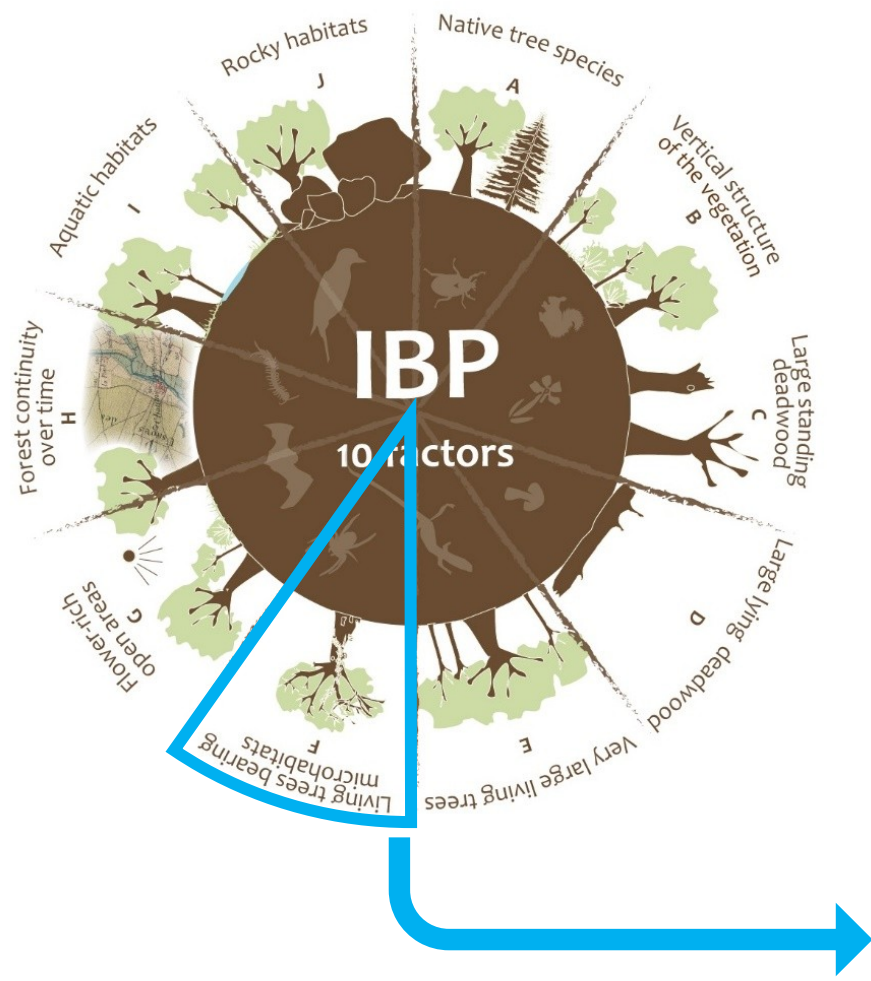
Developing and using statistical tools to estimate observer effect for ordered class data: The case of the IBP (Index of Biodiversity Potential)

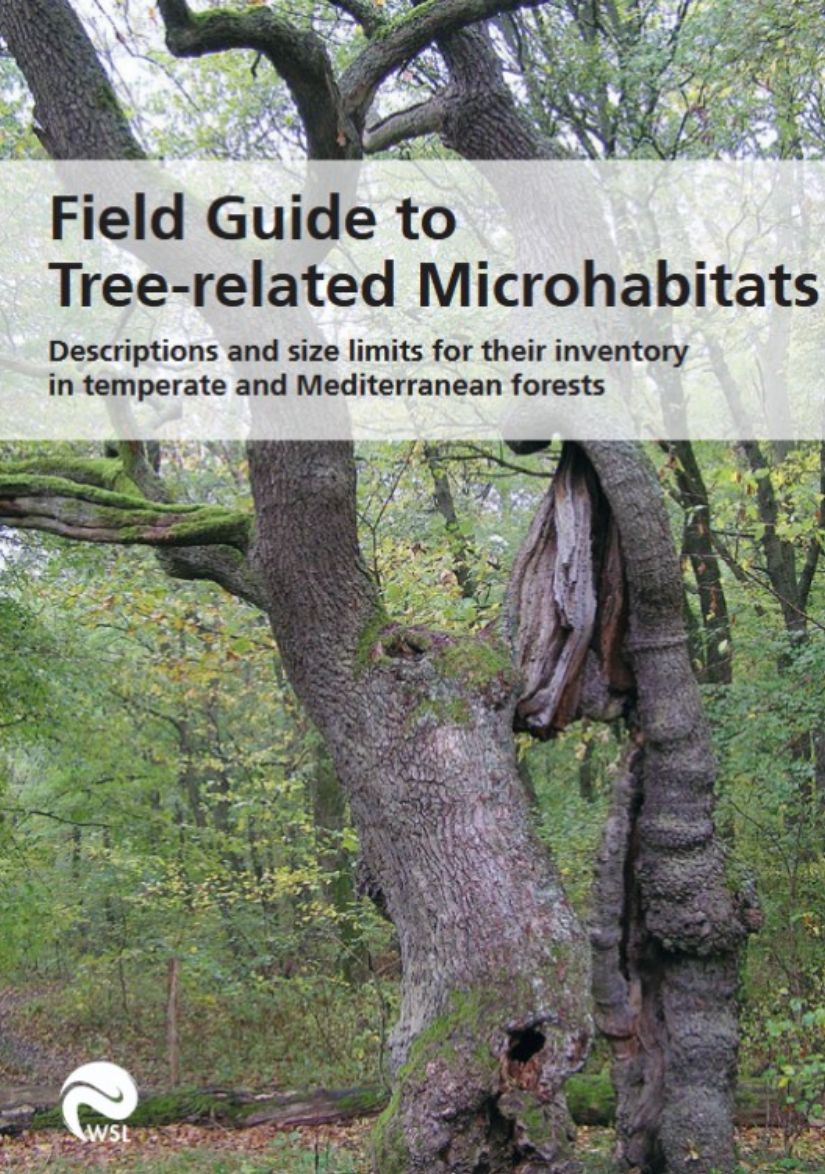
Frédéric Gosselin <sup>a</sup>, Laurent Larrieu <sup>b,c</sup>

And even more .....



## Monitoring of tree-related microhabitats is of particular interest





# Field Guide to Tree-related Microhabitats

Descriptions and size limits for their inventory in temperate and Mediterranean forests

Woodpecker breeding cavities

## Cavities

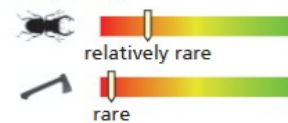
### 3 Large woodpecker breeding cavity ( $\varnothing > 10$ cm)

Woodpecker breeding cavity with an oval entrance  $> 10$  cm in diameter. The Black Woodpecker generally excavates its cavities in the main tree trunk.



Minimum size: Cavity entrance  $\varnothing > 10$  cm

Frequency:



Replacement rate: fairly rapid



Associated species:

**Did you know?** The vertebrates that are secondary users of woodpecker cavities can transport large quantities of branches, grass and other materials into the cavity. Nitrogen input in the form of faeces, leftover food or carcasses becomes a source of energy for the many invertebrates that also live inside the cavities.

## Excrescences

Twig tangles

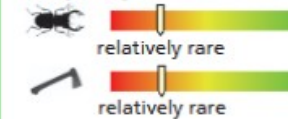
### 29 Witches' broom

A dense mass of intertwined twigs on a branch.

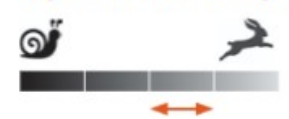


Minimum size:  $\varnothing > 50$  cm (experts' threshold)

Frequency:

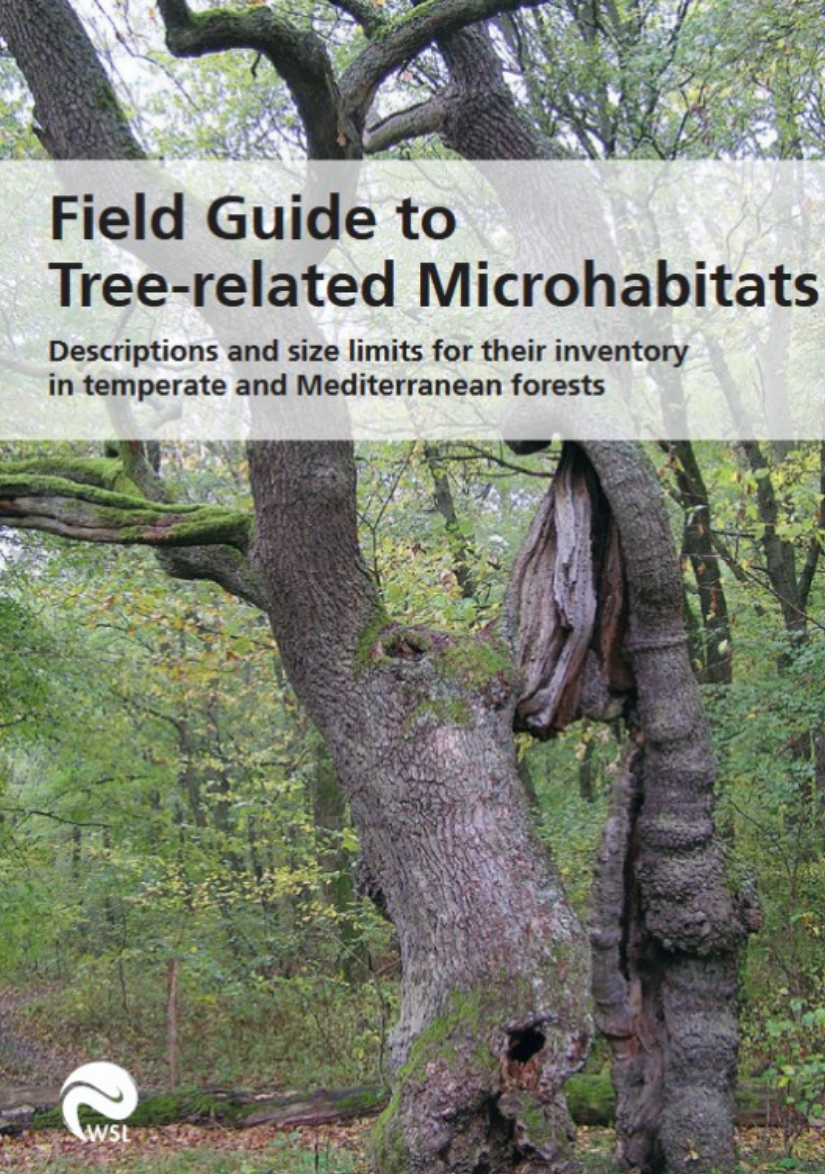


Replacement rate: fairly rapid



Associated species:

**Did you know?** The mass of intertwined twigs caused by witches' broom sometimes support the nests of small passerines like the short-toed treecreeper or the Eurasian wren, but birds of prey like the common buzzard may also build nests there.



## Field Guide to Tree-related Microhabitats

Descriptions and size limits for their inventory in temperate and Mediterranean forests

## Monitoring of tree-related microhabitats is of particular interest

frontiers | Frontiers in Forests and Global Change

SYSTEMATIC REVIEW  
published: 08 July 2022  
doi: 10.3389/ffgc.2022.818474



### Tree-Related Microhabitats Are Promising Yet Underused Tools for Biodiversity and Nature Conservation: A Systematic Review for International Perspectives

Maxence Martin<sup>1,2\*</sup>, Yoan Paillet<sup>1</sup>, Laurent Larrieu<sup>1,4</sup>, Christel C. Kern<sup>7</sup>, Patricia Raymond<sup>14</sup>, Pierre Drapau<sup>13</sup> and Nicole J. Fenton<sup>11</sup>



Biological Conservation  
Volume 301, January 2025, 110867



### Spatial distribution of tree-related microhabitats in European beech-dominated forests

Laurent Larrieu<sup>a, b</sup>, Christophe Bouget<sup>c</sup>, Benoit Courbaud<sup>d</sup>, Inken Doerfler<sup>e</sup>, Nicolas Goux<sup>f, g</sup>, Michel Goulard<sup>h</sup>, Sylvie Ladet<sup>h</sup>, Fabien Laroche<sup>g</sup>, Amandine Aclouque<sup>g</sup>, Rita Büttler<sup>h, i</sup>, Daniel Kozák<sup>j</sup>, Daniel Kraus<sup>k</sup>, Frank Krumm<sup>l</sup>, Thibault Lachat<sup>l, m</sup>, Maxence Martin<sup>n</sup>, Jörg Müller<sup>o, p</sup>, Yoan Paillet<sup>q</sup>, Andreas Schuck<sup>r</sup>, Jonas Stillhard<sup>s</sup>, Miroslav Svoboda<sup>t</sup>, Sergey Zudin<sup>u</sup>



Editors  
Frank Krumm  
Andreas Schuck  
Andreas Rigling

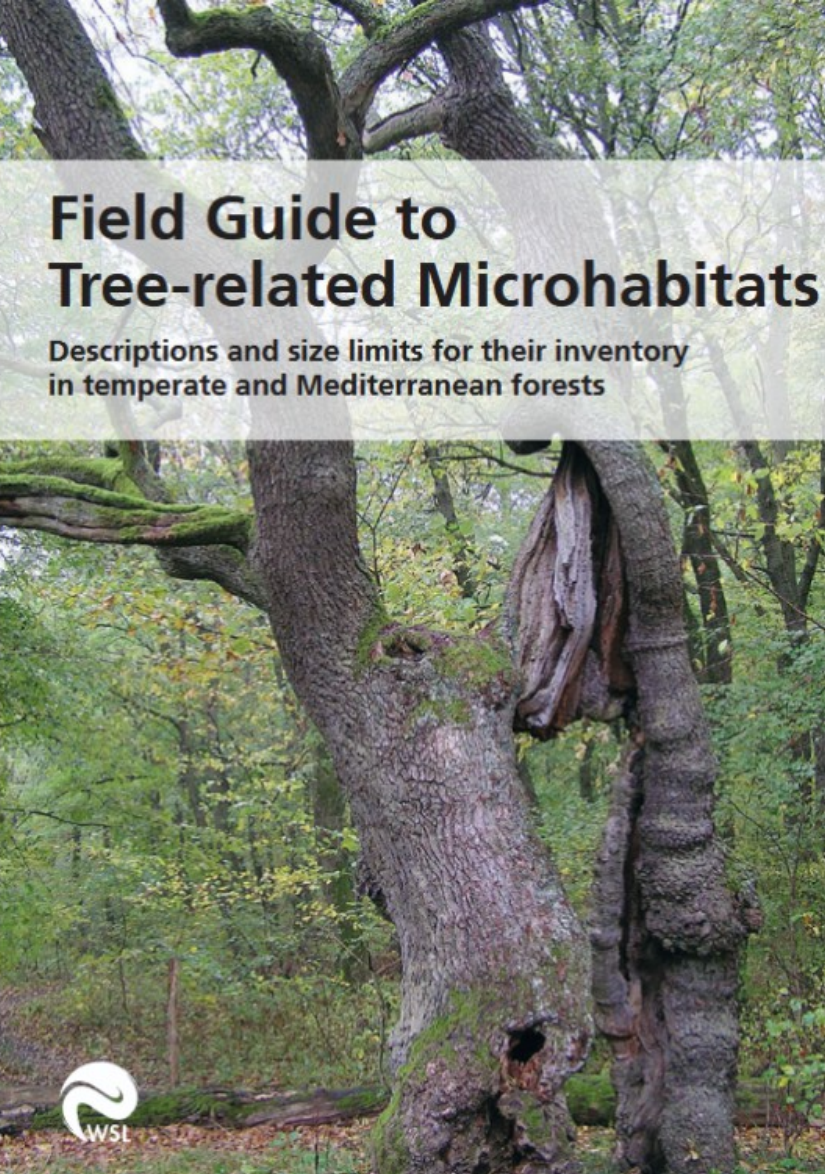
### How to balance forestry and biodiversity conservation

A view across Europe



Recommendations for maintaining a minimum density of habitat-trees are now integrated into most forest policies and certification schemes in Europe

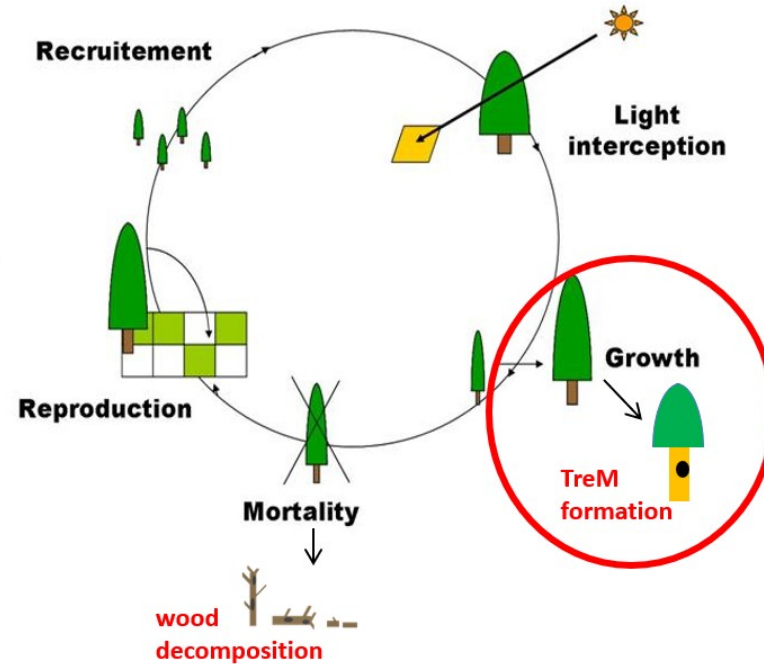
Towards enhanced conservation strategies based on retention trees



# Field Guide to Tree-related Microhabitats

Descriptions and size limits for their inventory in temperate and Mediterranean forests

## Monitoring of tree-related microhabitats is of particular interest



Received: 1 March 2021 | Accepted: 19 October 2021  
DOI: 10.1111/1365-2664.14068

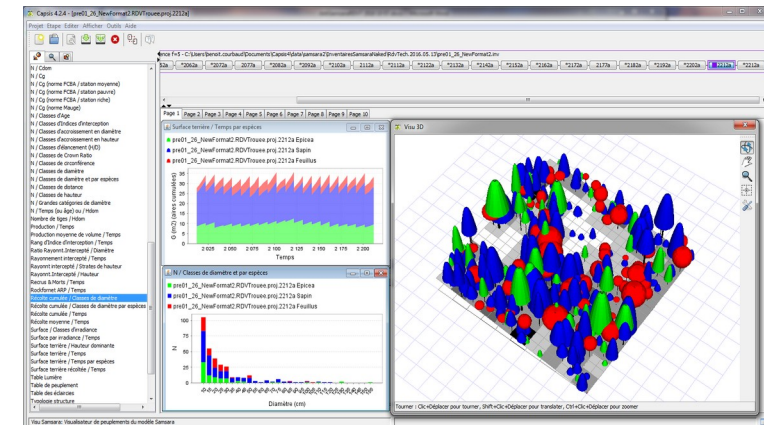
Journal of Applied Ecology

RESEARCH ARTICLE

### Factors influencing the rate of formation of tree-related microhabitats and implications for biodiversity conservation and forest management

Benoit Courbaud<sup>1</sup> | Laurent Larrieu<sup>2,3</sup> | Daniel Kozak<sup>4</sup> | Daniel Kraus<sup>5,6</sup> | Thibault Lachat<sup>7,8</sup> | Sylvie Ladet<sup>2</sup> | Jörg Müller<sup>9</sup> | Yoan Paillet<sup>10,11</sup> | Khosro Sagheb-Talebi<sup>12</sup> | Andreas Schuck<sup>13</sup> | Jonas Stillhard<sup>8</sup> | Miroslav Svoboda<sup>4</sup> | Sergey Zudin<sup>14</sup>

## Capsis platform

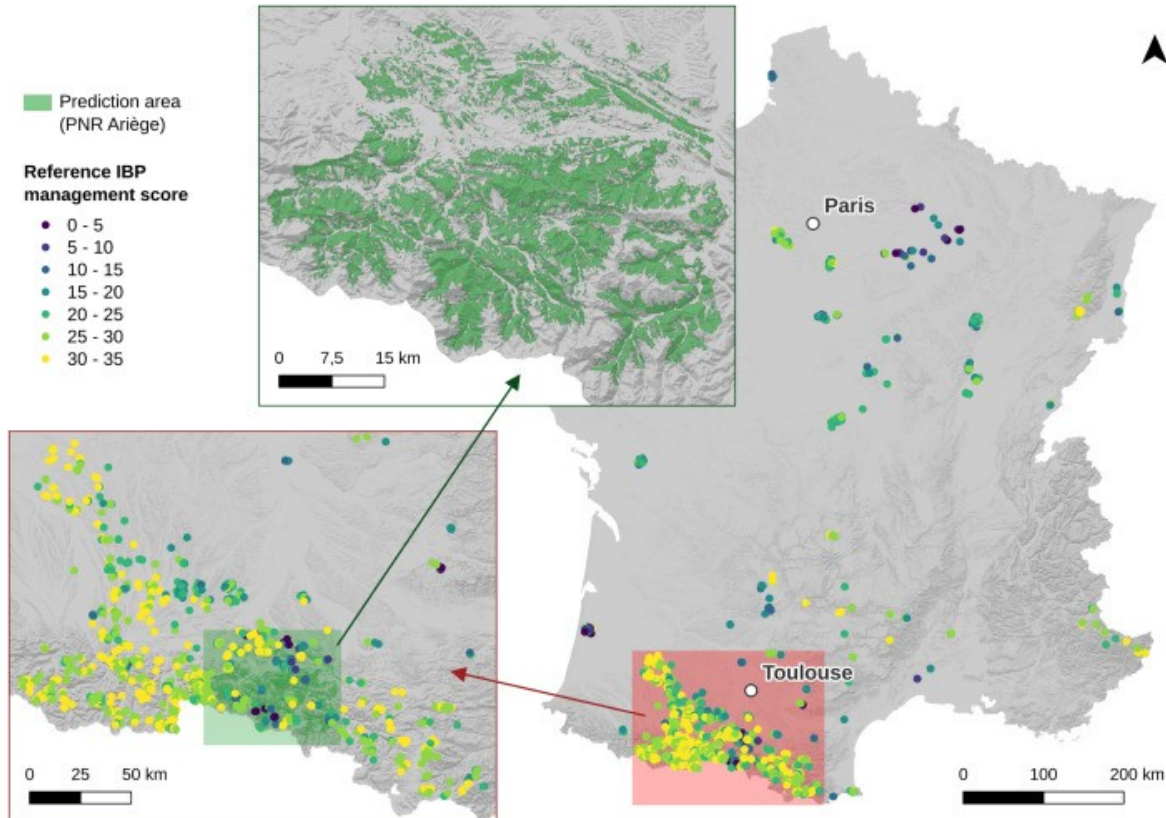


To better understand the impact of silvicultural practices





## Despite the growing interest in the IBP and TreMs among scientists and practitioners, consolidating data at an international scale remains challenging due to a lack of dedicated tools



For example, compiling large-scale data in order to calibrate a lidar-based model capable of predicting IBP remains a challenge :



Forest Ecology and Management  
Volume 601, 1 February 2026, 123305



Habitat quality assessment of temperate forest ecosystems: An airborne LiDAR-based approach to predict the Index of Biodiversity Potential (IBP) at large scale ☆

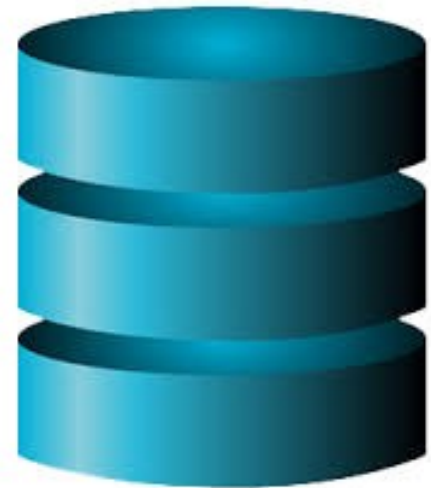
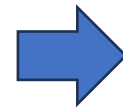
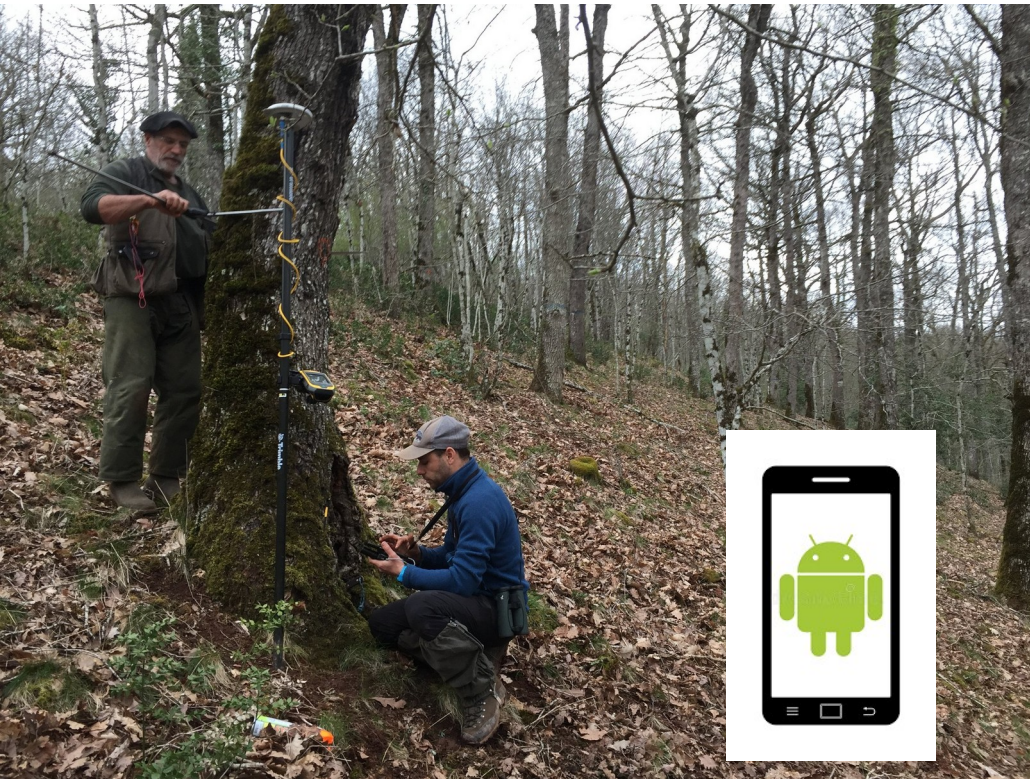
Manon Collard <sup>a</sup>, Olivier Martin-Ducup <sup>b</sup>, Nicolas Mellado <sup>c</sup>, Laurent Larrieu <sup>a, d</sup>, Fabien Laroche <sup>a</sup>, Nicolas Gouix <sup>a</sup>, Antoine Brin <sup>f</sup>, Pierre Gonin <sup>g</sup>, David Sheeren <sup>a</sup>

**Need more data for a better representativity of various forest contexts at large scale !**

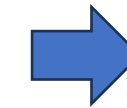


In order to promote the use of IBP and TreMs approach

Our initial idea :



Database



Raw data

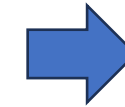


Diagramme IBP (Index Biodiversité Potentielle)

Nom du site : Mas de Martel - Nom du relevé : IBP\_BIO\_6



Automatic generated output



## Based on ODK ecosystem



OPEN DATA KIT

*ODK Collect* is an open source Android app that replaces paper forms used in survey-based data gathering. It supports a wide range of question and answer types, and is designed to work well without network connectivity.

### WHY ODK?

## The standard for offline data collection

Millions of people use ODK to collect data because it works anywhere. Here are a few features you'll love.



#### Build powerful forms

Include photos, GPS locations, skip logic, calculations, external datasets, multiple languages, and more.

#### Collect data offline

Use either the mobile app or the web app. Forms and submissions are synced when a connection is found.

#### Analyze with ease

Download your data or connect apps like Excel, Power BI, or R to create live-updating dashboards.

#### Proven at global scale

ODK is used in every country, with individual projects regularly collecting millions of submissions.

#### Trusted across sectors

Use software that is the standard in public health, global development, crisis response, climate monitoring, and more.

#### Open source

ODK is open-source software. Use it as is, customize it as you see fit, or try compatible alternatives.

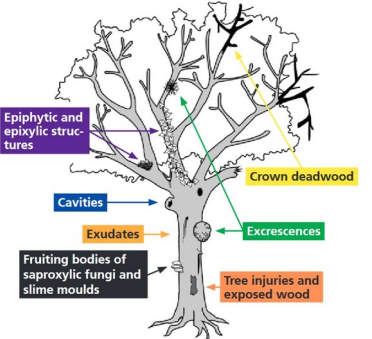


# Two forms have been developed for TreMs and IBP field data entry

14:54


TREMs\_collect\_v2

TreMs Collect



TreMs Collect is a tool for collecting TreMs data.  
Version bêta. DOI:xx

developed by




Suivant >

14:46

TREMs\_collect\_v2

Version bêta. DOI:xx

developed by



Nicolas Goux (CEN Occitanie) et Laurent Larrieu (CNPF / INRAE DYNAFOR) with the collaboration of Mathieu Bossaert, Rita Büttler, Hannes Cosyns, Céline Emberger, Fabien Laroche, Hugo Norel, Kris Vandekerckhove, ...

Link to TreMs guide

Büttler, R.; Lachat, T.; Krumm, F.; Kraus, D.; Larrieu, L., 2020: Field guide to tree-related microhabitats. Descriptions and size limits for their inventory. 58 p. [www.wsl.ch](http://www.wsl.ch)

contact: [nicolas.goux@cen-occitanie.org](mailto:nicolas.goux@cen-occitanie.org)

Suivant >

14:42

IBP Collect 3.2



IBP Collect est un outil pour la saisie des données de l'Indice de Biodiversité Potentielle (IBP).

developpé par



Suivant >

14:43

IBP Collect 3.2

developed by



Nicolas Goux (CEN Occitanie) and Laurent Larrieu (CNPF / INRAE DYNAFOR) with the collaboration of Pierre Gonin, Céline Emberger, Pauline Marty, Mathieu Bossaert, Hugo Norel, Claire Arondel

Link to IBP documentation

Larrieu L. & Gonin P.: 2008 - The Potential Biodiversity Index (PBI): a simple and rapid method for assessing the potential biodiversity of forest stands. Rev. For. Fr. 06-2008, p. 727-748 [PBI PORTAL](http://PBI.PORTAL)

contact: [nicolas.goux@cen-occitanie.org](mailto:nicolas.goux@cen-occitanie.org)

Version 3.2 of the IBP. All rights reserved

Suivant >



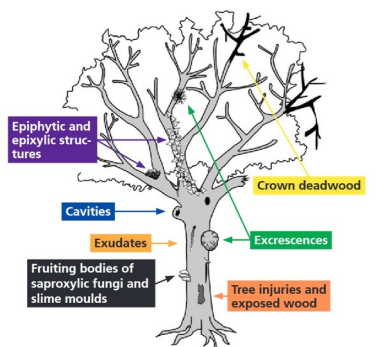
# 1) Description and location of the survey

\* The red asterisks indicate the mandatory fields

14:54

TREMs\_collect\_v2

TREMs Collect



TreMs Collect is a tool for collecting TreMs data. Version bêta. DOI:xx

developed by



Suivant >

14:47

TREMs\_collect\_v2

Plot description

\* Site name

Test

\* Plot code

Test\_1

\* Last Year of Logging

<30 years

30-50 years

51-100 years

>100 years

Precise Year of Logging, if available

< Retour

Suivant >

14:47

TREMs\_collect\_v2

\* Level of study of TreMs

Group (19)

Type (52)

Sub-type

\* Data type

At tree scale

Presence / absence

Abundance

\* Minimum dbh for recording

Specify the minimum diameter of trees described (in cm)

17.5

Description of accuracy level of TreMs

< Retour

Suivant >

14:48

TREMs\_collect\_v2

Localisation

\* Select a Georeferencing method

One or several trees located individually

Fixed area plot

Fixed angled plot (relasopic)

Area with a specific shape and surface

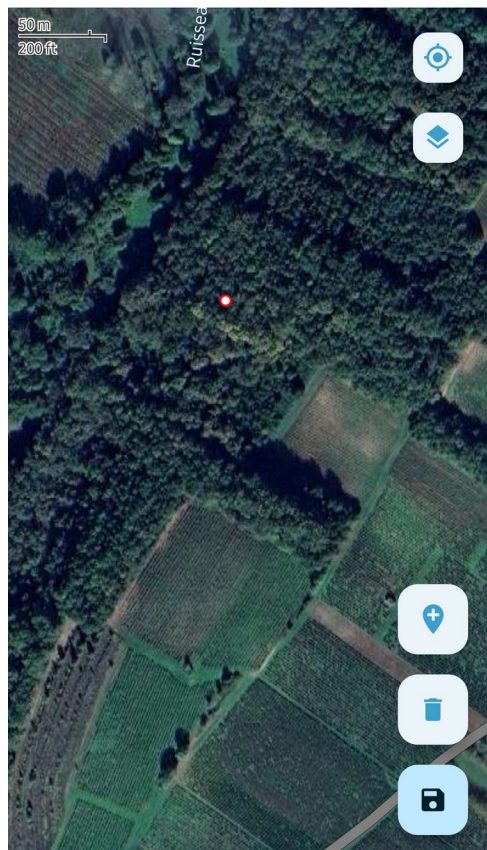
< Retour

Suivant >

14:49

Appuyez longuement pour placer un marqueur ou utilisez le bouton d'ajout de marqueur

Précision : 9,37 m.





## 2) Description of TreM-bearing trees

The screenshots illustrate the data entry process in the TREMs\_collect\_v2 app:

- Screenshot 1 (14:49):** Shows the 'Select tree species' screen. The user has entered 'quer' in the search bar. A list of Quercus species is displayed, including Quercus rotundifolia, Quercus ithaburensis subsp. macrolepis, Quercus petraea, Quercus pubescens, Quercus pyrenaica, Quercus robur, Quercus rubra, Quercus suber, Quercus arizonica, and Quercus emoryi.
- Screenshot 2 (14:49):** Shows the 'Tree configuration' screen. The user has selected 'One stem'. An instruction states: 'TreMs should be described for each free stem above 1.3 m in height. Only stems greater than 17.5 in diameter should be described'. There is also an option to 'Add a tree ID?' with 'no' selected.
- Screenshot 3 (14:50):** Shows the 'Status' screen. The user has selected 'Living tree'. Other options include 'Standing dead tree (> 1,30m)', 'Log', and 'Stump (< 1,30m)'. Below this is the 'Select saproxylation level' screen, where the user has selected level '1'. Notes on saproxylation levels are provided:
  - Stade 1:** Fresh deadwood (<1 year), hard and not rotten. Phloem alive or at least perceptible. More than 95% of the bark is still attached to the stem.
  - Stade 2:** 2-to-3-year old deadwood, still hard. Phloem dead and not perceptible. The knife blade penetrates with difficulty (few mm) even in the same direction as the wood fiber.
  - Stade 3:** Deadwood is starting to rot. The outer wood is soft, the inner wood still not rotten.
- Screenshot 4 (14:50):** Shows the 'Diameter (in cm)' screen. The user has entered '85' in the DBH field. The 'Height (in m)' field is currently empty.

# TreMs Collect and IBP Collect: two new apps designed for collecting data on tree related microhabitats and the Index of Biodiversity Potential

Goux N., Bossaert M., Büttler R., Courbeau B., Emberger C., Marty P., Norel H., Larrieu L.



## 2) Description of TreMs



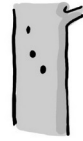
14:50 [📶] [📶] 67

TREMs\_collect\_v2 [📄] [☰] [⋮]

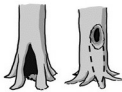
A tree > 1 > TreMs for a stem > 1

**\* TreM Type**  
\* TreMs that can be detailed at Sub-type (cf. Larrieu L., June 2024) are marked with an asterisk


Woodpecker flute (string of  $\geq 3$  breeding cavities)



\*Trunk-base rot-hole (closed top, ground contact)



\*Trunk rot hole (closed top, no ground contact)



[< Retour] [Suivant >]

[☰] [○] [<]

14:50 [📶] [📶] 67

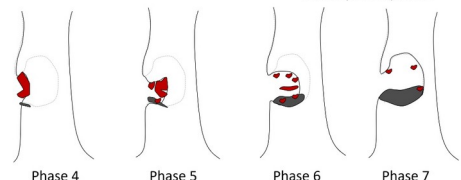
TREMs\_collect\_v2 [📄] [☰] [⋮]

A tree > 1 > TreMs for a stem > 1 > TreM Sub-type

Specify the sub-type (cf. Larrieu L. - June 2024 - unpublished) of the following TreMs:

**\* Trunk rot hole (closed top, no ground contact)**

Development phases



Phase 4    Phase 5    Phase 6    Phase 7

■ Decaying wood    ■ Mould

Sélectionnez la Réponse ▼

[< Retour] [Suivant >]

[☰] [○] [<]

14:51 [📶] [📶] 67

TREMs\_collect\_v2 [📄] [☰] [⋮]

**TreMs observed on the tree:**

Small woodpecker breeding cavity ( $\varnothing < 4$  cm)

Large woodpecker breeding cavity ( $\varnothing > 10$  cm)

Trunk rot hole

*Trunk rot hole, phase 5,  $\varnothing$  3-10*

Semi-open trunk-base rot-hole

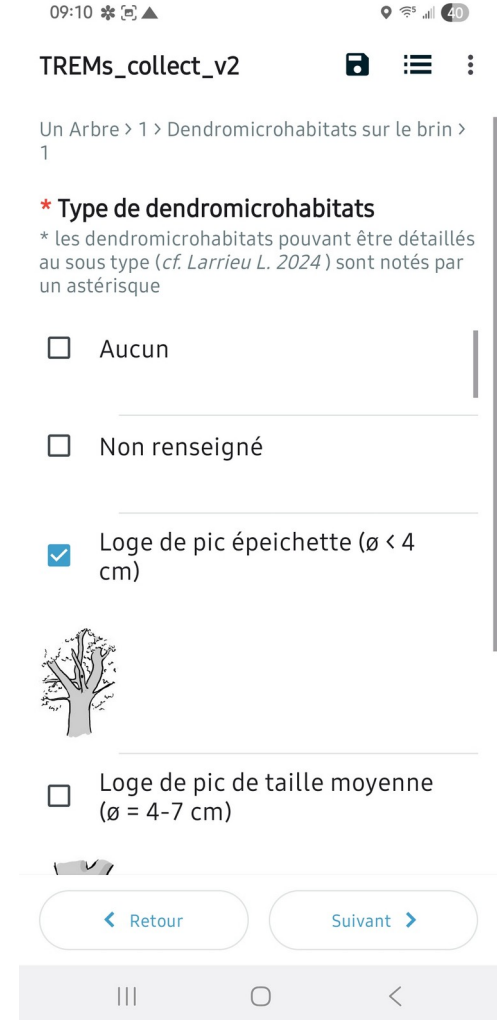
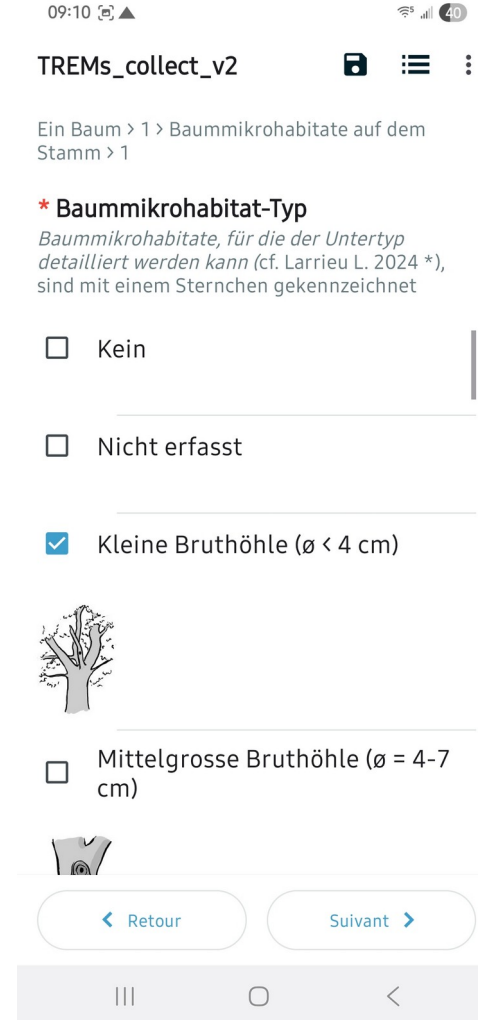
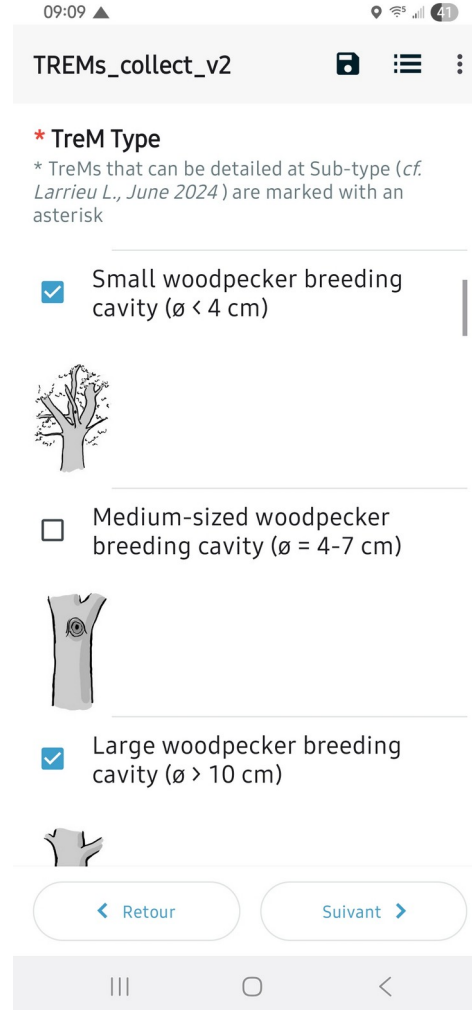
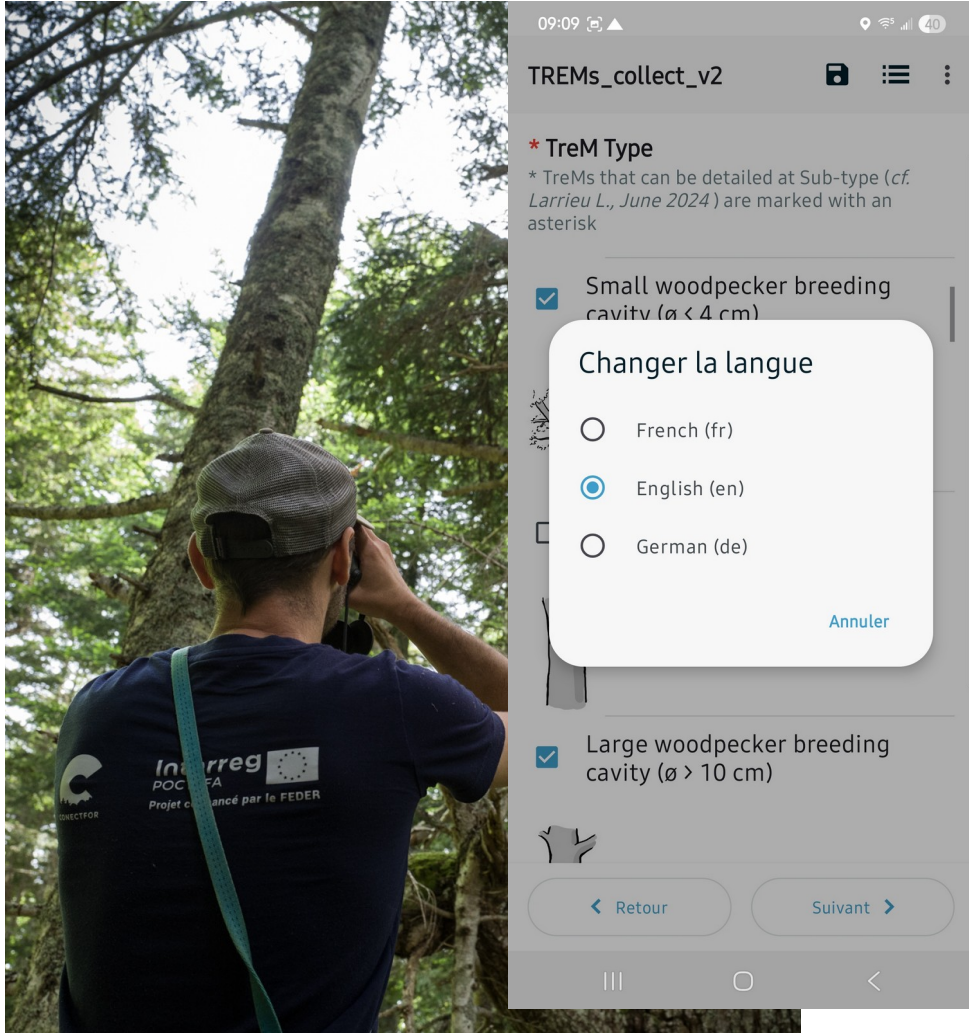
*Semi-open trunk-base rot-hole, phase*

[< Retour] [Suivant >]

[☰] [○] [<]

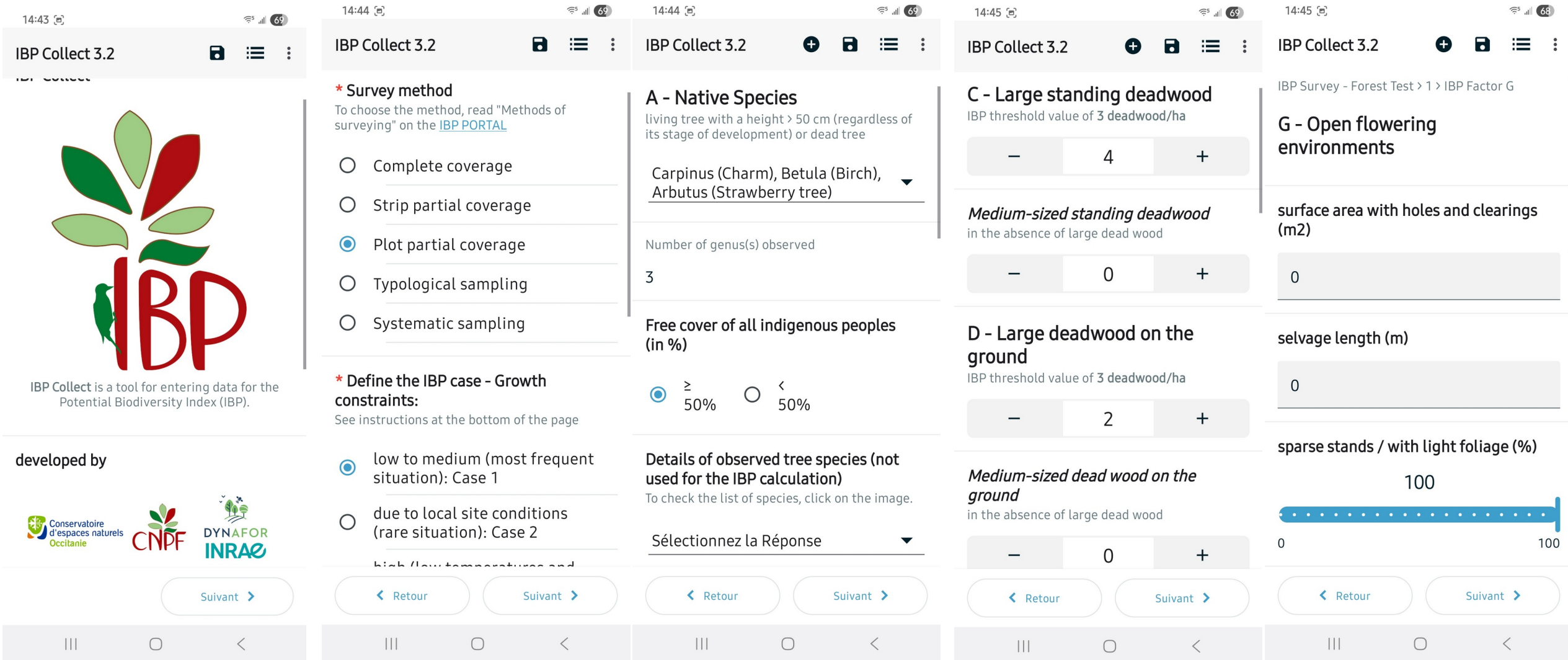


## Multilanguage support





## Using different types of widgets from the ODK ecosystem



The screenshot displays five sequential screens of the IBP Collect 3.2 mobile application, demonstrating different ODK widget types used for data collection.

- Screen 1 (14:43):** Shows the app title "IBP Collect 3.2" and a large logo for the Index of Biodiversity Potential (IBP). Below the logo, it states: "IBP Collect is a tool for entering data for the Potential Biodiversity Index (IBP)." It also lists the developers: "developed by Conservatoire d'espaces naturels Occitanie, CNPF, and DYNAFOR INRAE".
- Screen 2 (14:44):** Titled "\* Survey method", it provides instructions: "To choose the method, read 'Methods of surveying' on the [IBP PORTAL](#)". It features a list of radio button options: "Complete coverage", "Strip partial coverage", "Plot partial coverage" (selected), "Typological sampling", and "Systematic sampling".
- Screen 3 (14:44):** Titled "A - Native Species", it defines the criteria: "living tree with a height > 50 cm (regardless of its stage of development) or dead tree". It includes a dropdown menu with "Carpinus (Charm), Betula (Birch), Arbutus (Strawberry tree)" selected. Below, it shows a text input field for "Number of genus(s) observed" with the value "3".
- Screen 4 (14:45):** Titled "C - Large standing deadwood", it shows a numeric keypad with the value "4" entered. Below, it has another section for "Medium-sized standing deadwood" with a numeric keypad showing "0".
- Screen 5 (14:45):** Titled "G - Open flowering environments", it features a numeric keypad with "0" entered. Below, it has a section for "selvage length (m)" with a numeric keypad showing "0". At the bottom, it shows a "sparse stands / with light foliage (%)" widget with a horizontal slider set to "100".

Each screen includes a "Retour" (Back) button and a "Suivant" (Next) button at the bottom, along with standard mobile OS navigation icons.



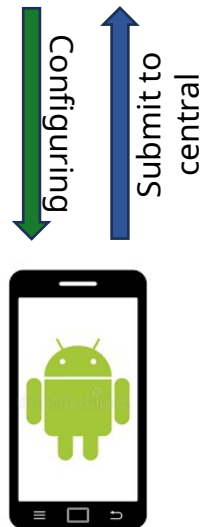
# How does it work ?



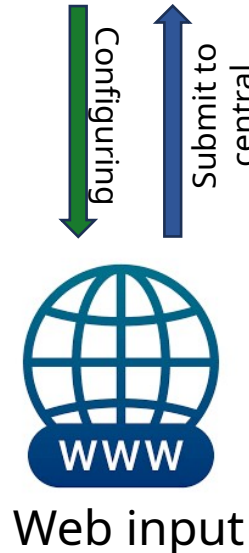
XLS Form



Configuring →



Or



Export Raw data ↗



Data consolidation



TreMs collect\_data for integration in International TREM Database



# How does it work ?



XLS Form



OPEN DATA KIT

Configuring



Configuring  
Submit to central

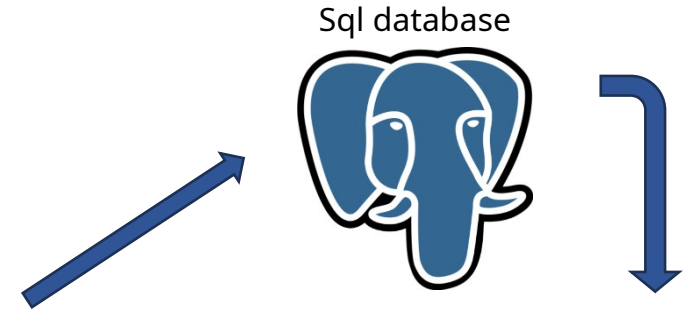


Or

Configuring  
Submit to central



Web input



## AppSmith interface for IBP data

IBPForest

Visualisation d'un relevé Données brutes

Map of Occitanie region showing collection sites.

date_time	foret	plot	operateur	code_projet	A
2025-04-25	Croix de cade	Croix de cade 1	Bastien Alagot	A_mc_vindl_com	1
2025-05-22	Les cresses	Les cresses 1	Bastien Alagot	A_mc_vindl_com	1
2025-06-03	Leuze	Ligne5 Leuze 1	Jérémy Pratière	MC Ligne 5	2
2025-03-31	Mas de bonnet ouest	Mas de bonnet est	Bastien Alagot	A mc vindl com	2
2025-03-20	La ga	La ga nord	Bastien Alagot	Top la ga	1
2025-04-25	Croix de cade	Croix de cade 4	Bastien Alagot	A_mc_vindl_com	5

Génération des graphiques IBP


Diagramme IBP (Index Biodiversité Potentielle)

IBP (Index Biodiversité Potentielle): IBP contexte vs IBP pe gestion



IBPForest

Visualisation d'un relevé Données brutes



Date: Select Date  
Forêt: Sélectionner une à plusieurs forêts  
Plot:   
Opérateur:   
Code du projet:   
50 km

date_time	foret	plot	operateur	code_projet	A
2025-04-25	Croix de cade	Croix de cade 1	Bastien Alegot	A_mc_vinci_com	1
2025-05-22	Les cresses	Les cresses 1	Bastien Alegot	A_mc_vinci_com	1
2025-06-03	Lauze	Ligne5 Lauze 1	Jérémie Pratviel	MC Ligne 5	2
2025-03-31	Mas de bonnel ouest	Mas de bonnel est	Bastien Alegot	A mc vinci com	2
2025-03-20	Le ga	Le ga nord	Bastien Alegot	Ibp le ga	1
2025-04-25	Croix de cade	Croix de cade 4	Bastien Alegot	A_mc_vinci_com	5

Nombre de données par page: 50  
Numéro de la page: 1  
Nombre total de données affichées: 56

Relevé IBP - Ibp le ga

Méditerranéenne

A - Données autochtones	1
B - Données exotiques et autres espèces (non utilisées pour le calcul d'IBP)	2
C - Bois morts au sol de grande dimension	5
D - Bois morts au sol de petite dimension	5
E - Trés gros bois vivants	5

## Benefits of IBP

Automatic generation of reports and charts

Each user can only view their own data

Option to download your own entire dataset

In progress: Multilanguage support in project  
Support documentation (manual ...)

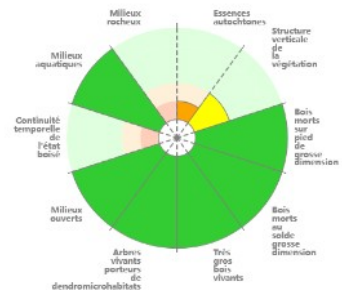
And we hope the same will be available soon for the TreMs 😊

### Génération des graphiques IBP

Téléchargement des graphiques

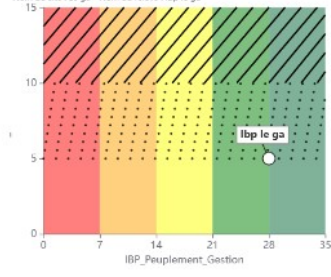
Diagramme IBP (Indice Biodiversité Potentielle)

Nom du site: Le ga - Nom du relevé: Ibp le ga



IBP (Indice Biodiversité Potentielle): IBP contexte vs IBP pe et gestion

Nom du site: Le ga - Nom du relevé: Ibp le ga





## How does it work ?



### For smartphone data entry:

1) Install the ODK Collect app on an Android device:

<https://play.google.com/store/apps/details?id=org.odk.collect.android&hl=fr&gl=US>

2) Configure ODK Collect using the attached QR code (Once the app is open, tap the three dots in the top right corner of the screen and select "Configure via QR code")

3) Enter your email address in your user preferences

### For online data entry -> Link to a web data entry interface

For TreMs:

[https://central.sicen.fr/f/rchTr76Pt MuhRTZAGY4nxFyQv6Ct8AB?st=meVhgQvQy7vz6M\\$Yg8QVzPa3AY\\$P95BYvQcu2VOIwfdDKHVoKkkO66JxGZK\\$2PPo](https://central.sicen.fr/f/rchTr76Pt MuhRTZAGY4nxFyQv6Ct8AB?st=meVhgQvQy7vz6M$Yg8QVzPa3AY$P95BYvQcu2VOIwfdDKHVoKkkO66JxGZK$2PPo)

For IBP:

[https://central.sicen.fr/f/Jx8M2Hm03OPuAxb8619TnIE0MTV9cRI?st=48T3ESI3Dtbqsx17lrf8Itt!6oXEanqTdUuTy\\$HfbfNfl9\\$KuzJVLci8URBqKng](https://central.sicen.fr/f/Jx8M2Hm03OPuAxb8619TnIE0MTV9cRI?st=48T3ESI3Dtbqsx17lrf8Itt!6oXEanqTdUuTy$HfbfNfl9$KuzJVLci8URBqKng)

TreMs Collect and IBP Collect: two new apps designed for collecting data on tree-related microhabitats and the Index of Biodiversity Potential

Goux N., Bossaert M., Büttler R., Courbeau B., Emberger C., Marty P., Norel H., Larrieu L.



Thanks for your attention !

