

# Acoustic Ecology of European Bats

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Species Identification, Study of their Habitats and Foraging Behaviour

Website provided with the book Barataud M. 2020. — *Acoustic Ecology of European Bats. Species Identification, Study of their Habitats and Foraging Behaviour*. 2<sup>nd</sup> éd. Biotope éditions, Mèze ; Muséum national d'Histoire naturelle, Paris (Inventaires & biodiversité series), 368 p.

## SOUNDS FILES FOLDER

The 'SOUNDS' folder contains three sub-subfolders:

- 1 5 sequences of biological or synthetic signals as a complement to the text of the general introduction on acoustics (chapters 1 and 2 of the book).
- 2 68 sequences recorded from bats in the field, as a complement to the part of Chapter 4 devoted to bat identification by means of heterodyned sequences. The comments and explanations corresponding to each sequence are given in the "Comments.pdf" file as they appear in the book.
- 3 224 sequences recorded from bats in the field, as a complement to the part of Chapter 4 devoted to bat identification by means of x 10 time-expanded sequences. The comments and explanations corresponding to each sequence are given in the "Comments\_x 10 time-expanded sequences.pdf"<sup>1</sup> file as they appear in the book.

## "SCATTER\_DIAGRAMS\_IDENTIFICATION" FOLDER

The "SCATTER\_DIAGRAMS\_identification" folder contains nine Excel files:

- One "Measures\_Empty-Tables.xls" file. It contains tables in which measurement values obtained on unidentified signals may be entered. The values may thus be compared with those plotted in the scatter diagrams, and saved later if needed.
- Eight files with names starting with "Identification", one per group of species, in which can be found the scatter diagrams used in the final stage of the identification process (measurement of the signals with the computer software and comparison with values obtained from reference signals and plotted on the diagrams; see "Methodology for the measurement of signals" (p. 90 of the book) and "Reading scatter diagrams" (p. 147 of the book)).

**Warning 1 :** A utility module for the management of the scatter diagrams was developed by Roland Jamault and included in the 'Identification...' xls files. This module includes macros ('xls\_identification\_Barataud' certificate), guaranteed free of virus, which are necessary for managing the diagrams (see 'Warning 2' below). When an 'Identification...' file is opened for the first time, a pop-up window gives a warning about the macros accompanying the file. The objective is to activate the macros to enable the utility module. This activation will only need to be done once, on the first file opened, on any given computer. The computer will thereafter recognize the certificate and automatically activate the macros on all files carrying the same 'xls\_identification\_Barataud' certificate, i.e. all the 'Identification...' files and their successive updates. The procedure for activating the macros and importing the certificate depends on the Excel version present on the computer. The procedures corresponding to the different Excel versions are detailed at the end of the document.

#### IN CASE OF PROBLEMS WHEN ACTIVATING THE MACROS AND USING THE MODULE

Some computer configurations may refuse to install the certificate (some businesses protect their computer equipment by locking macros, for example): in that case, the module contained in the xls files cannot be employed. Besides, this module cannot operate on Macintosh computers.

In all cases, the files remain accessible and can be used in normal mode. It is possible to alter the order of the series as follows:

- double-click on one of the data points; the 'data series format' window opens;
- select the 'series order' tab;
- select a taxa in the list and click on 'move upwards' or 'move downwards';
- click on 'OK' to check whether new data points have appeared on the scatter diagram in the area considered (see Figures 2 and 3).

**Warning 2 :** In many instances, some data points in scatter diagrams mask one another because their coordinates are the same. The hidden data points may belong to the same species, in which case there is no possibility to ascertain their presence (and no real need to either). Sometimes, superposed data points correspond to different species and may mask the true distribution of the reference data points of the species underneath. The data points are displayed on the scatter diagrams in the order in which the corresponding taxa are listed in the legend. It follows that each additional taxon listed may have some of its data points overlying data points of the preceding taxa.

It is not possible with Excel to display the minimum convex polygon to show the distribution of the values measured on the signals of a given species.

A module was integrated in the 'Identification...' xls files by Roland Jamault to solve the hidden data point problem. To open the module, click on *one* of the diagrams to select it (on the outside border of the diagram), then type 'ctrl + b' with the keyboard. A 'Diagram utility' window appears, with two tabs:

- 'series order' modifies the order in which the taxa are listed so that you can check whether there are any hidden data points. To do this, select one of the taxa and click on the green arrows 'move upwards' or 'move downwards', or alternatively use the red arrow to select the desired taxon and place the corresponding data points on top in the diagram. You can now check whether new data points of this taxon have appeared in the area considered of the scatter diagram (**Figures 1 and 2**).
- 'display/mask' enables you to select the taxa (one or several) you wish to see displayed on the scatter diagram simply by ticking/unticking the names from the list. You can then check the distribution of the data points in the absence of other species' data points. The initial diagram with all the species' data points can be summoned back at any time by clicking on the icon with the rotating arrows.

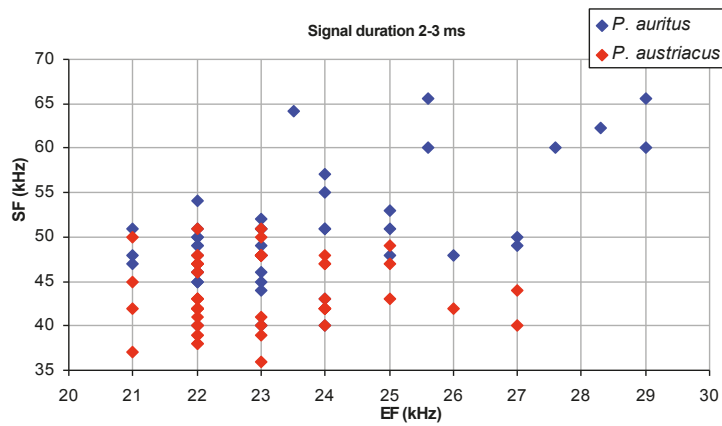


Figure 1: Scatter diagram of end frequency (EF) against start frequency (SF) showing distribution of reference data points corresponding to *Plecotus auritus* and *Plecotus austriacus*. Since the latter species is listed last in the legend, its data points will overlie those of other species in case of superposition; it may therefore be concealing other data points corresponding to *P. auritus*.

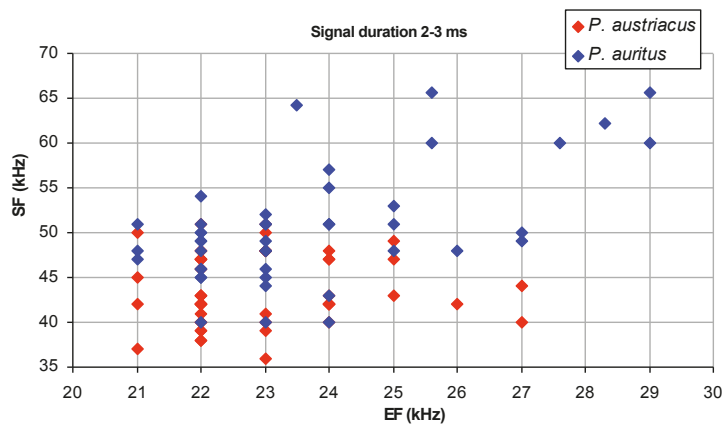


Figure 2: The same scatter diagram as above (Figure 1), but with the order of the data series reversed. We can see that additional data points have appeared corresponding to *Plecotus auritus* between 40 and 43 kHz of start frequency, showing that this particular domain of SF is not a monospecific area, contrary to what Figure 1 suggested.

## ACTIVATION PROCEDURES OF THE MACROS CONTAINED IN THE 'IDENTIFICATION...' XLS FILES WITH THE DIFFERENT VERSIONS OF EXCEL

### OPTION 1

Excel > 2007



### OPTION 2

Excel 2000

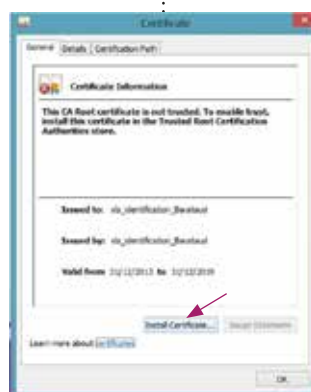
(active tick box: simplified procedure)



or

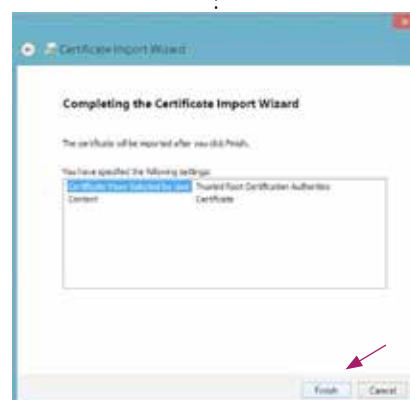
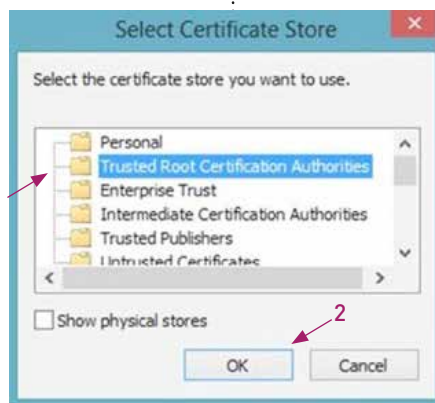
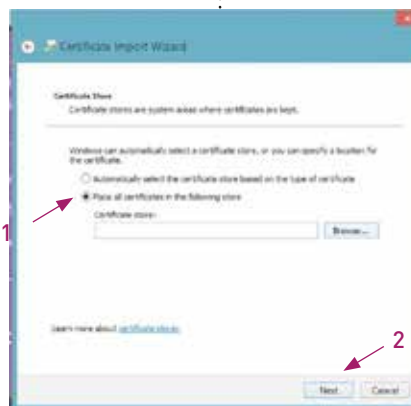
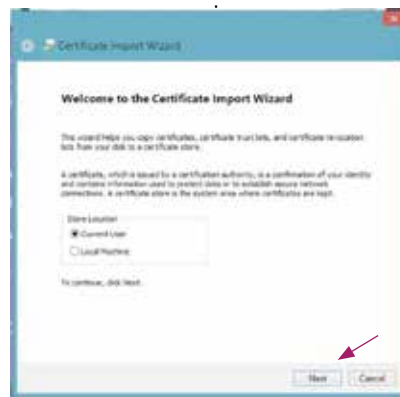
Excel 2003

(inactive tick box)



OPTION 1  
Excel > 2007

OPTION 2  
Excel 2000



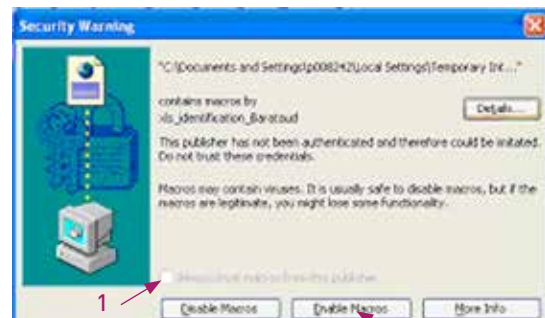
**OPTION 1**  
Excel > 2007

**OPTION 2**  
Excel 2000



Close the file. When re-opened:

All the windows are closed by clicking on 'OK' each time.  
Save, then close the file.  
When re-opening a file carrying this certificate, click on the  
tab of the warning that is displayed at the top of the page.  
The warning will then cease to be displayed.



(optional screen)