

Kaleidoscope – Tutorial

Beginner (Level 1) to Intermediate (Level 2)

V2.0 (May 2019)

This tutorial has been developed as a working document, and is currently still in draft format. This software undoubtedly has much more functionality etc. than described here. We have done our best to describe the easiest ways to perform the tasks described, however we would not be surprised to learn that there are things the software can do that have not been touched upon here, or that there are alternative/more effective ways to carry out some of the tasks described.

Health Warning – Bat Call Analysis

Many bat species can be reasonably confidently identified from echolocation recordings alone (e.g. Pipistrelle species, Noctule), whilst for others (e.g. *Myotis* species) the same degrees of confidence cannot be established beyond doubt. It must therefore be accepted that in many instances being 100% confident to species levels is unwise, if not impossible, & certainly not scientifically robust. There can be circumstances when the species applicable can be narrowed down to a few, & this is as far as it is safe to go.

In some instances, the analyst cannot say to a 100% degree of confidence that the calls labelled under *Myotis* names, for example, are, beyond doubt, correct. The standard prescript to each of these calls should read, *'This call is characteristic of the following species, which are thought to produce similar parameters...'*. This is quite different to saying that, *'this call definitely belongs to that species'*.

When it comes to many species in some circumstances, some species in many circumstances, & others in all circumstances, echolocation alone is not enough to give 100% confidence in a result. Sometimes the only way to get to 100% is either using social calls emitted (for some species), DNA (e.g. from a roost) or identifying the bat in the hand. In addition, when using call classifiers, it is not uncommon for the classifier to mis-identify a bat species, or indeed allocate a non-bat species (e.g. small terrestrial mammal) or other noise, to a bat species. As such, a good knowledge of all noise that can potentially occur within a soundscape is beneficial.

Correspondence

Any correspondence relating to this tutorial, including any additional material provided can be directed to:

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Introducing Kaleidoscope

What follows is a practical, step by step, tutorial enabling you to use the software as it is presented to you on the screen. The aim is to take you from 'beginner level' through to 'intermediate', & to introduce you to the functions & tools that most bat workers would use, most of the time, across a typical project.

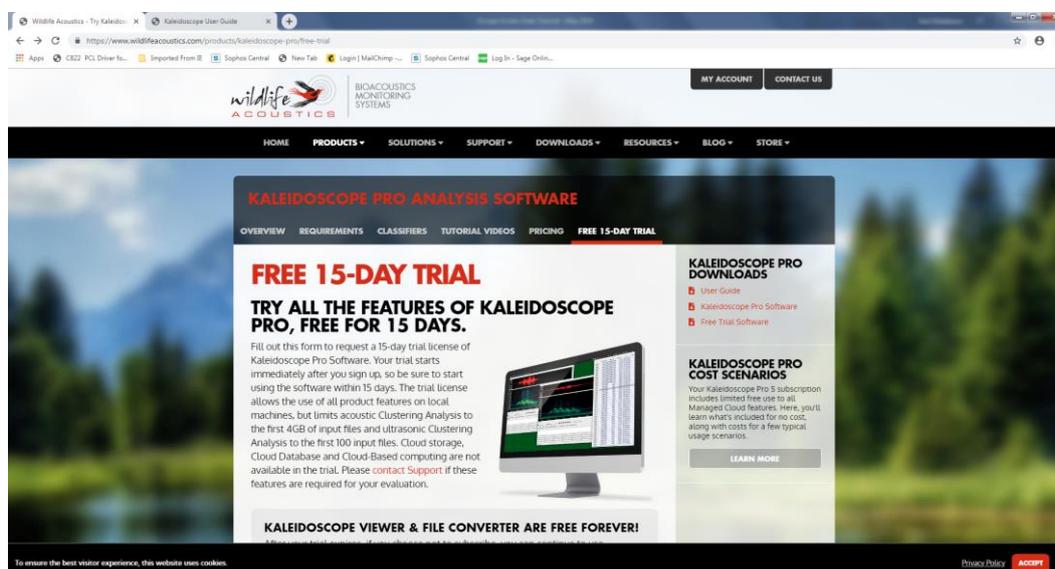
There are many advanced features within the software that are not covered here, & you should also be aware that the developer (www.wildlifeacoustics.com) is constantly updating the functionality of the software. It is always advisable to ensure you are using the latest version of the software, the User Manual provided by the manufacturer, as well as the up-to-date firmware on your bat detector.

Software

The software can be downloaded from the Wildlife Acoustics website, via the following link:
<https://www.wildlifeacoustics.com/download/kaleidoscope-software>



You may be eligible for a free trial period, which is available via this link:
<https://www.wildlifeacoustics.com/products/kaleidoscope-pro/free-trial>

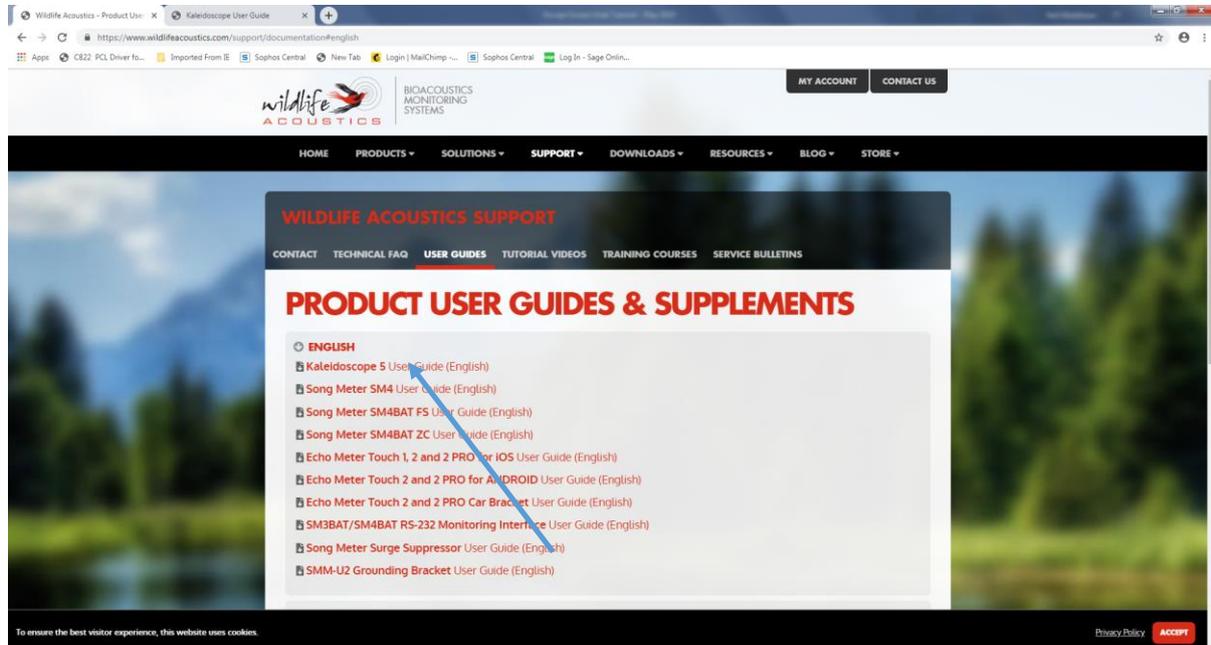


User Manual & Video Tutorials

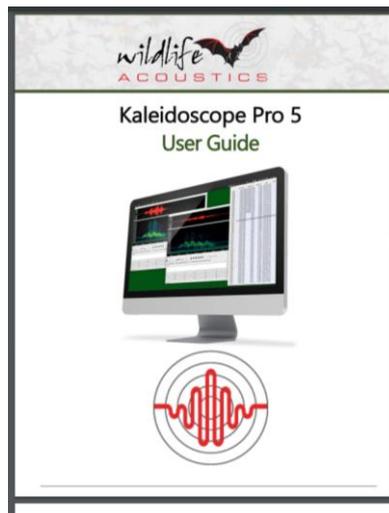
A User Manual is available for the software via the Wildlife Acoustics website using the link as shown below:

<https://www.wildlifeacoustics.com/support/documentation#english>

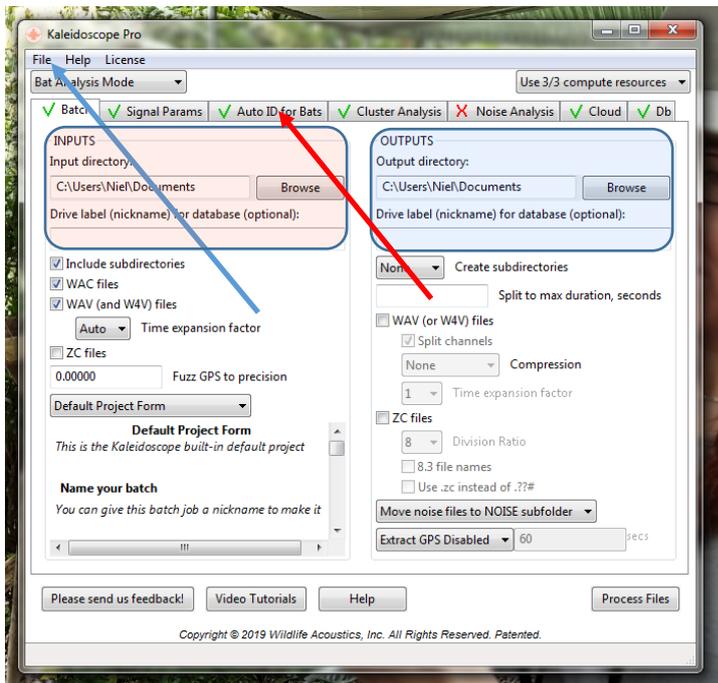
Click on the 'User Guide' (see blue arrow)



The User Manual contains information and details about functions beyond what is covered within this tutorial & is always worth referring to when faced with a technical query. Video tutorials are also available via the website.



When you first open the software you will see the following 'Control Panel' screen. The first thing to do is to default this screen to bat-related settings. To do this click on **'File'** (blue arrow), and then **'Set defaults'**. Choose **'Bat Analysis Mode'** and then **'OK'**.

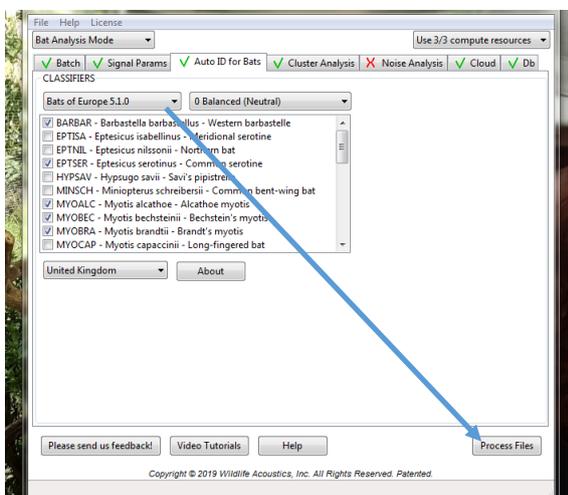


Next we are going to download and view a folder of recorded files. One way to do this is to use the 'Inputs' and 'Outputs' options on the Control Panel. First of all use the **'Browse'** option on the 'Inputs' column (left) (red hatched area) and find the folder where your files are stored for the recording session. Next, on the right column browse (blue hatched area) for the folder where you wish the recordings to be saved. If you select preferences and 'Process Files' at this stage the data will be saved within the output folder. The tutor will demonstrate this.

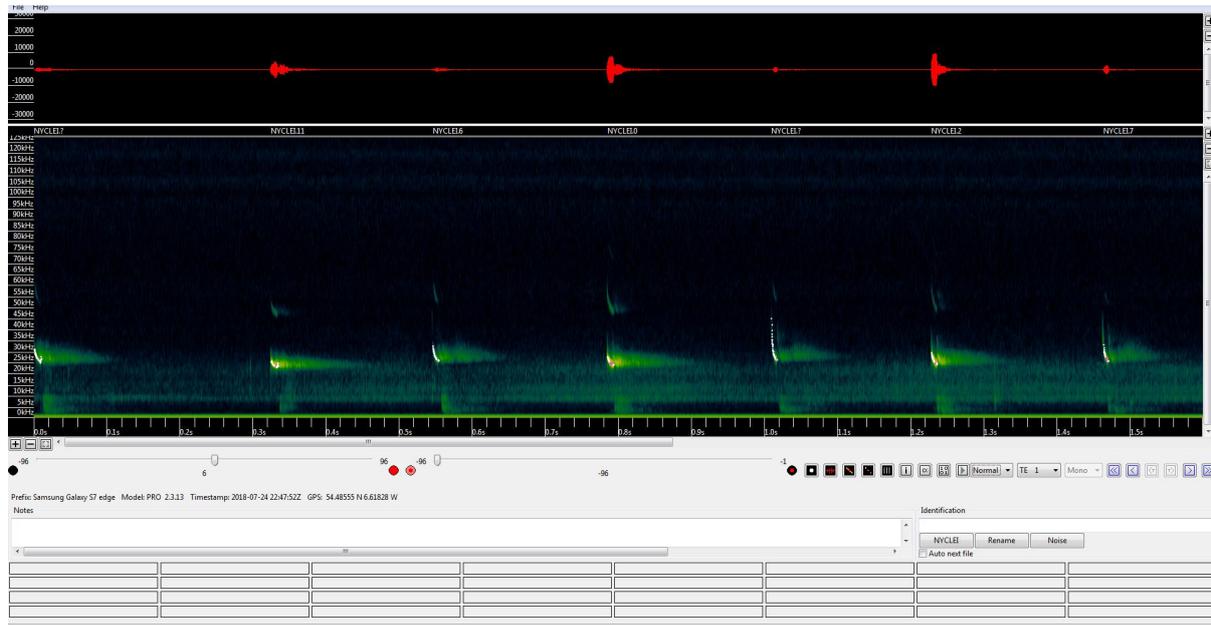
You may also wish to choose some of the other options available on the Control Panel. The tutor will give you a brief overview of some of these.

Going back a step, many people may wish to carry out a Bat ID process at this point. To do this, again choose the input and output options, however next click on **'Auto ID for Bats'** (red arrow).

Within this screen select your region, and then **'Process Files'**



Upon completion the 'Viewer' will open (as below) showing the first call in the folder, along with a spreadsheet of the results for your folder (also shown below).



The tutor will now demonstrate who the viewer and the spreadsheet interact.

Overview of Viewer Dashboard

The tutor will now give you a tour of the main functions/tools available to you from the software's Viewer window.

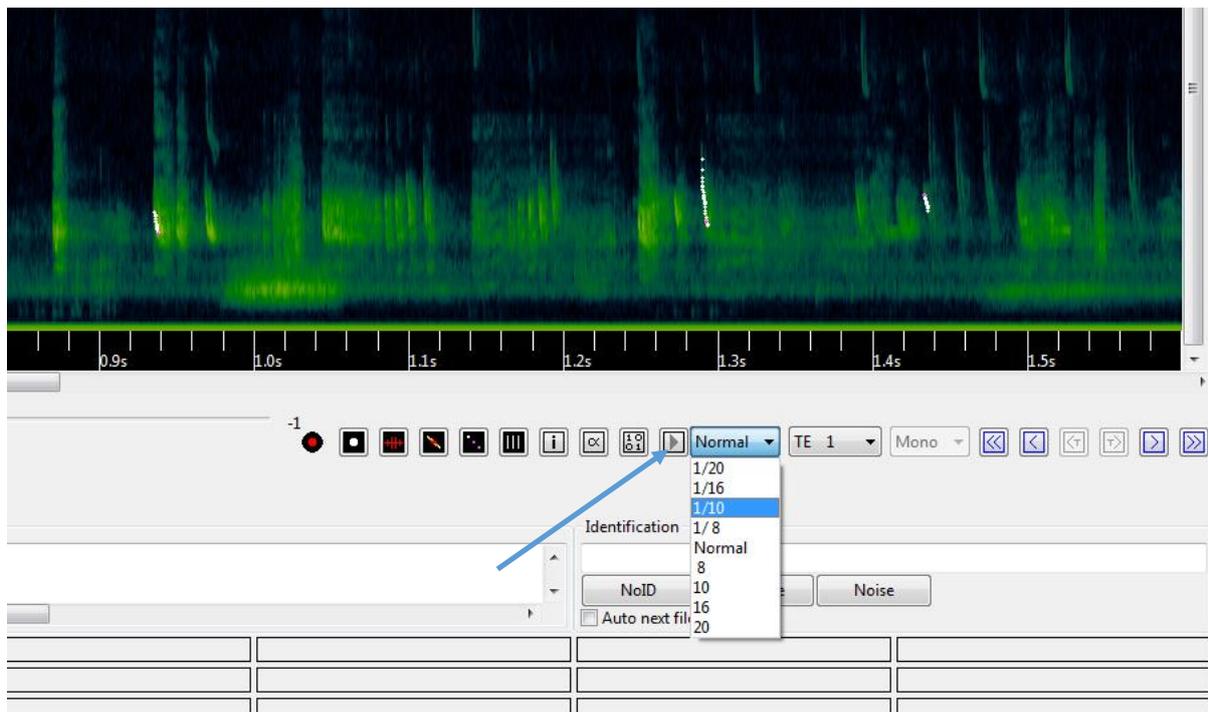
The screenshot displays the software's Viewer window, which is divided into two main sections. The top section shows an oscillogram (waveform) with a red signal against a black background. The bottom section shows a spectrogram with a green and yellow signal against a black background. The x-axis represents time, ranging from 0.0s to 1.5s. The y-axis represents frequency, ranging from 0Hz to 20000Hz. The interface includes a menu bar (File, Help), a toolbar with various icons, and a control panel with sliders and buttons. Blue arrows point to specific areas of the interface:

- Visually**: Points to the top toolbar.
- Oscillogram**: Points to the waveform display.
- Spectrogram**: Points to the spectrogram display.
- Other Modes & Tools**: Points to the toolbar below the spectrogram.
- Audio Options**: Points to the 'Normal' and 'Mono' buttons.
- Scrolling**: Points to the 'Identification' and 'Auto next file' buttons.

Listening to Calls

You have the option to listen to calls in real time 'normal' mode, which usually isn't useful if it's an ultrasonic bat call, but may help with problem solving if the call is audible. More usually, to listen to bat calls you would convert the call to x10 time expansion. To do this change the 'normal' setting to **1/10** (i.e. one tenth) as shown below, and press the play button > (blue arrow).

Note that adjustments to the gain threshold impacts upon amplitude and as such will impact upon what you are able to hear accurately when listening. The tutor will demonstrate this.



Other functions will be demonstrated, including:

Zoom In / Zoom Out / Zoom Entire File

Brightness / Contrast

Toggle Inverse Video

Toggle Waveform

Toggle Full Spectrum / Three Way Toggle (inc ZCA)

Compress

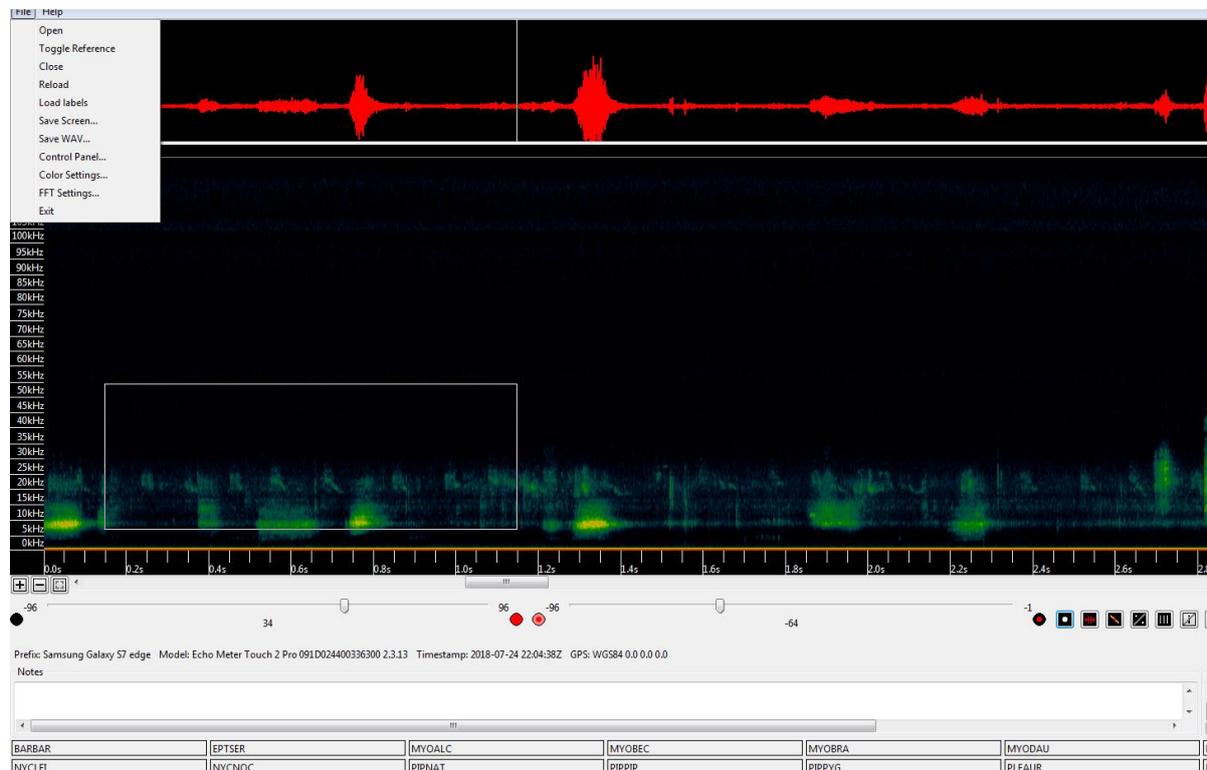
AutoID (inc [] AutoID next file option)

Metadata View

Analyse / Zoom to Fit

File Options via Viewer

Clicking on **File** on the Viewer (at the top left) opens up other functions.



The following options via the 'File' selection panel will be demonstrated by the tutor:

Load labels

Save Screen

Save .wav (Note: sound will be saved as per how it's set at time)

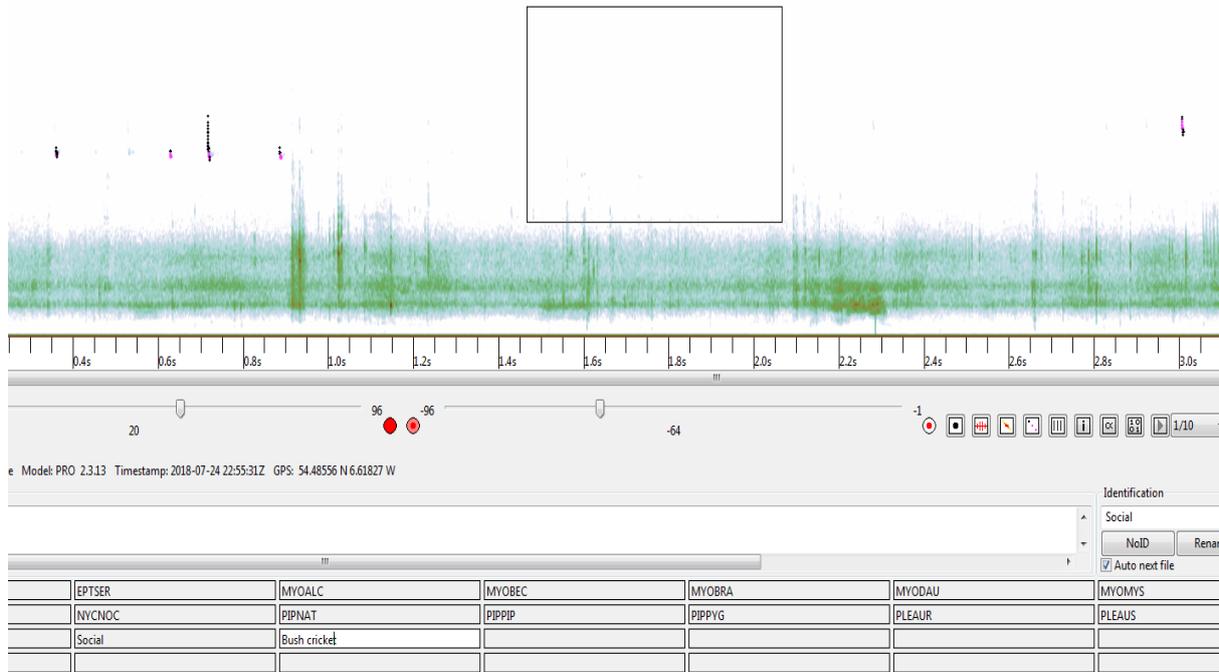
Colour Settings

FFT Settings

Auto ID & Labelling Calls

With the 'Auto next file' box ticked, when you select a description from the species labels, the file will be labelled and the next file will be opened. You can also add additional labels to the options available, by right clicking over an empty box and then selecting that new label.

These functions will be demonstrated by the tutor.



As files are allocated manually applied labels the spreadsheet will become populated with this new information, as follows (see red hatched area):

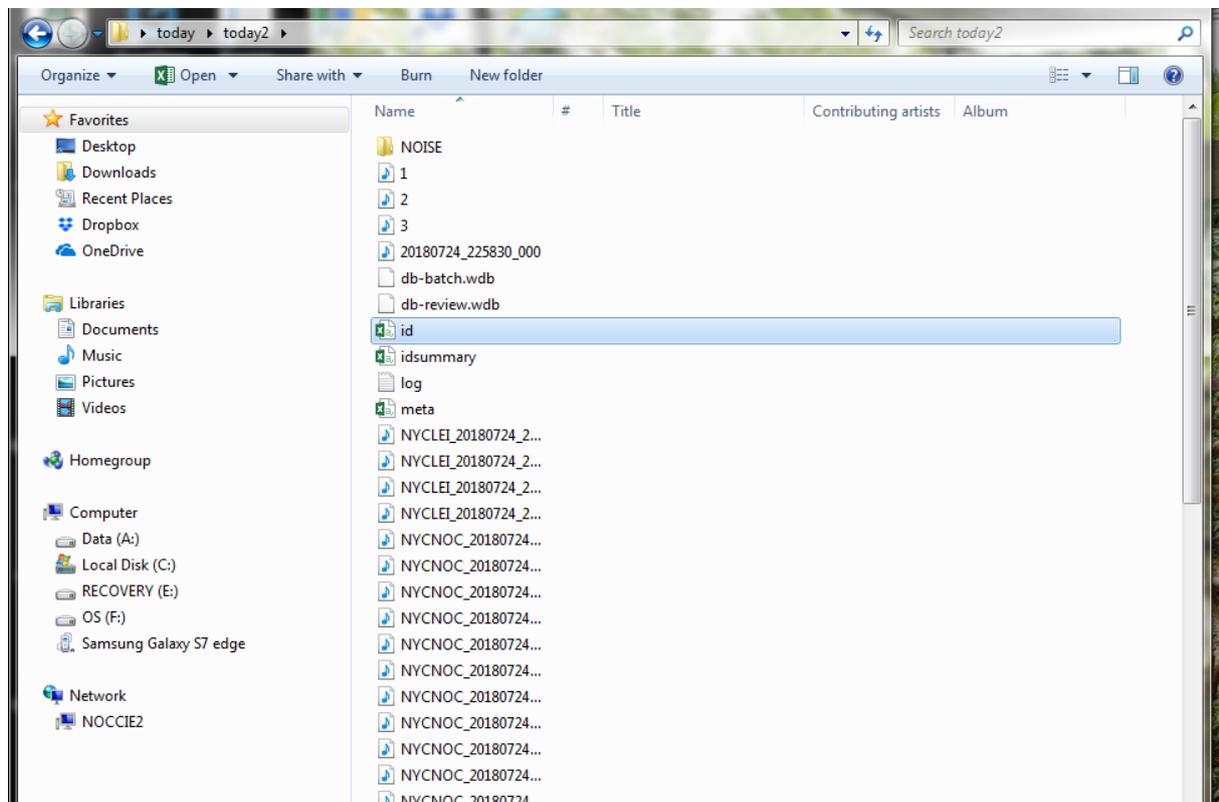
LDER	IN FILE	OUT FILE FS	OUT FILE ZC	AUTO ID	PULSES	MATCHING	MATCH RATIO	MANUAL ID
	PIPPYG_20180724_225549.wav	PIPPYG_20180724_225549_000.wav		NoID	55	0	0.000000	MYOMYS
	PLEAUR_20180724_223825.wav	PLEAUR_20180724_223825_000.wav		NoID	6	0	0.000000	MYOMYS
	PIPPYG_20180724_221938.wav	PIPPYG_20180724_221938_000.wav		Noise				MYONAT
	PIP NAT_20180724_225649.wav	PIP NAT_20180724_225649_000.wav		PIP NAT	68	59	0.868000	MYONAT
	PIP NAT_20180724_225718.wav	PIP NAT_20180724_225718_000.wav		PIP NAT	78	51	0.654000	MYONAT
	PIP NAT_20180724_225710.wav	PIP NAT_20180724_225710_000.wav		PIP NAT	50	34	0.680000	PIPPYG
	20180724_225830.wav	20180724_225830_000.wav		PIPPIP	170	61	0.359000	PIPPYG
	PIPPIP_20180724_225212.wav	PIPPIP_20180724_225212_000.wav		PIPPIP	16	16	1.000000	PIPPYG
	PIPPYG_20180724_223907.wav	PIPPYG_20180724_223907_000.wav		PIPPIP	2	1	0.500000	
	PIPPYG_20180724_225757.wav	PIPPYG_20180724_225757_000.wav		PIPPYG	88	87	0.989000	
	PIPPYG_20180724_223744.wav	PIPPYG_20180724_223744_000.wav		PIPPYG	95	75	0.789000	
	PIPPYG_20180724_225813.wav	PIPPYG_20180724_225813_000.wav		PIPPYG	107	71	0.664000	
	PIPPYG_20180724_224528.wav	PIPPYG_20180724_224528_000.wav		PIPPYG	71	70	0.986000	
	PIPPYG_20180724_225015.wav	PIPPYG_20180724_225015_000.wav		PIPPYG	74	62	0.838000	
	PIPPYG_20180724_223829.wav	PIPPYG_20180724_223829_000.wav		PIPPYG	100	61	0.610000	
	PIPPYG_20180724_224002.wav	PIPPYG_20180724_224002_000.wav		PIPPYG	62	44	0.710000	
	PIPPYG_20180724_223949.wav	PIPPYG_20180724_223949_000.wav		PIPPYG	55	41	0.745000	
	PIPPYG_20180724_224057.wav	PIPPYG_20180724_224057_000.wav		PIPPYG	38	37	0.974000	
	PIPPYG_20180724_223925.wav	PIPPYG_20180724_223925_000.wav		PIPPYG	74	37	0.500000	
	PIPPYG_20180724_224317.wav	PIPPYG_20180724_224317_000.wav		PIPPYG	37	35	0.946000	
	PIPPYG_20180724_223611.wav	PIPPYG_20180724_223611_000.wav		PIPPYG	40	35	0.875000	
	PIPPYG_20180724_225741.wav	PIPPYG_20180724_225741_000.wav		PIPPYG	35	34	0.971000	
	PIPPYG_20180724_223845.wav	PIPPYG_20180724_223845_000.wav		PIPPYG	57	34	0.596000	
	PIPPYG_20180724_223734.wav	PIPPYG_20180724_223734_000.wav		PIPPYG	42	33	0.786000	
	PIPPYG_20180724_224148.wav	PIPPYG_20180724_224148_000.wav		PIPPYG	32	32	1.000000	
	PIPPYG_20180724_225405.wav	PIPPYG_20180724_225405_000.wav		PIPPYG	34	32	0.941000	
	PIPPYG_20180724_223710.wav	PIPPYG_20180724_223710_000.wav		PIPPYG	40	32	0.800000	
	PIPPYG_20180724_223802.wav	PIPPYG_20180724_223802_000.wav		PIPPYG	76	32	0.421000	
	PIPPYG_20180724_224505.wav	PIPPYG_20180724_224505_000.wav		PIPPYG	31	31	1.000000	
	PIPPYG_20180724_225351.wav	PIPPYG_20180724_225351_000.wav		PIPPYG	31	30	0.968000	
	PIPPYG_20180724_223647.wav	PIPPYG_20180724_223647_000.wav		PIPPYG	43	30	0.698000	
	PIPPYG_20180724_224340.wav	PIPPYG_20180724_224340_000.wav		PIPPYG	29	29	1.000000	
	PIPPYG_20180724_224517.wav	PIPPYG_20180724_224517_000.wav		PIPPYG	29	29	1.000000	
	PIPPYG_20180724_225626.wav	PIPPYG_20180724_225626_000.wav		PIPPYG	34	29	0.853000	
	PIPPYG_20180724_223728.wav	PIPPYG_20180724_223728_000.wav		PIPPYG	37	29	0.784000	
	PIPPYG_20180724_223625.wav	PIPPYG_20180724_223625_000.wav		PIPPYG	39	28	0.718000	
	PIPPYG_20180724_225604.wav	PIPPYG_20180724_225604_000.wav		PIPPYG	27	27	1.000000	
	PIPPYG_20180724_225610.wav	PIPPYG_20180724_225610_000.wav		PIPPYG	26	26	1.000000	
	PIPPYG_20180724_224329.wav	PIPPYG_20180724_224329_000.wav		PIPPYG	27	26	0.963000	
	PIPPYG_20180724_223620.wav	PIPPYG_20180724_223620_000.wav		PIPPYG	29	26	0.897000	

Reporting Outputs

Prior to finishing project analysis it is important to save this information so it can be used for reporting purposes. To do this, within the spreadsheet window, go to **File**, then **Save**.

	IN FILE	OUT FILE FS	OUT FILE ZC	AUTO ID	PULSES	MATCHING	MATCH RATIO	MANUAL ID
11	NYCNOC_20180724_223348.wav	NYCNOC_20180724_223342_000.wav		EPTSER	29	3	0.103000	
12	NYCNOC_20180724_223322.wav	NYCNOC_20180724_223322_000.wav		NYCLEI	16	14	0.875000	
13	NYCNOC_20180724_223358.wav	NYCLEI_20180724_224752_000.wav		NYCLEI	11	10	0.909000	
14	NYCNOC_20180724_223941.wav	NYCLEI_20180724_223922_000.wav		NYCLEI	10	5	0.500000	
15	NYCNOC_20180724_223634.wav	NYCLEI_20180724_223119_000.wav		NYCLEI	7	4	0.571000	
16	NYCNOC_20180724_224023.wav	PIPPYG_20180724_220438_000.wav		NYCNOC	1035	344	0.332000	
17	PIPPYG_20180724_223242.wav	NYCNOC_20180724_223257_000.wav		NYCNOC	11	7	0.636000	
18	PIPPYG_20180724_223638.wav	NYCNOC_20180724_223707_000.wav		NYCNOC	5	5	1.000000	
19	PIPPYG_20180724_225531.wav	NYCNOC_20180724_223659_000.wav		NYCNOC	6	4	0.667000	
20	PIPPYG_20180724_225549.wav	NYCNOC_20180724_223441_000.wav		NYCNOC	3	2	0.667000	
21	PLEAUR_20180724_223825.wav	NYCNOC_20180724_223348_000.wav		NYCNOC	4	2	0.500000	
22	PIPPYG_20180724_221936.wav	NYCNOC_20180724_223322_000.wav		NYCNOC	2	1	0.500000	
23	PIP NAT_20180724_225649.wav	NYCNOC_20180724_223358_000.wav		NYCNOC	2	1	0.500000	
24	PIP NAT_20180724_225718.wav	NYCNOC_20180724_223941_000.wav		NYCNOC	6	1	0.167000	
25	PIP NAT_20180724_225710.wav	NYCNOC_20180724_223634_000.wav		NoID	4	0	0.000000	
26	20180724_225830.wav	NYCNOC_20180724_224023_000.wav		NoID	5	0	0.000000	
27	PIPPIP_20180724_225212.wav	PIPPYG_20180724_223242_000.wav		NoID	61	0	0.000000	
28	PIPPYG_20180724_223907.wav	PIPPYG_20180724_223638_000.wav		NoID	25	0	0.000000	
29	PIPPYG_20180724_225757.wav	PIPPYG_20180724_225531_000.wav		NoID	6	0	0.000000	MYOMYS
30	PIPPYG_20180724_223744.wav	PIPPYG_20180724_225549_000.wav		NoID	55	0	0.000000	MYOMYS
31	PIPPYG_20180724_225813.wav	PLEAUR_20180724_223825_000.wav		NoID	6	0	0.000000	MYOMYS
32	PIPPYG_20180724_224528.wav	PIPPYG_20180724_221936_000.wav		Noise				MYONAT
33	PIPPYG_20180724_225015.wav	PIP NAT_20180724_225649_000.wav		PIP NAT	68	59	0.868000	MYONAT
34	PIPPYG_20180724_223829.wav	PIP NAT_20180724_225718_000.wav		PIP NAT	76	51	0.654000	MYONAT
35	PIPPYG_20180724_224002.wav	PIP NAT_20180724_225710_000.wav		PIP NAT	50	34	0.680000	PIPPYG
36	PIPPYG_20180724_223949.wav	20180724_225830_000.wav		PIPPIP	170	61	0.359000	PIPPYG
		PIPPIP_20180724_225212_000.wav		PIPPIP	16	16	1.000000	PIPPYG
		PIPPYG_20180724_223907_000.wav		PIPPIP	7	1	0.500000	
		PIPPYG_20180724_225757_000.wav		PIPPYG	88	87	0.989000	
		PIPPYG_20180724_223744_000.wav		PIPPYG	95	75	0.789000	
		PIPPYG_20180724_225813_000.wav		PIPPYG	107	71	0.664000	
		PIPPYG_20180724_224528_000.wav		PIPPYG	71	70	0.986000	
		PIPPYG_20180724_225015_000.wav		PIPPYG	74	62	0.838000	
		PIPPYG_20180724_223829_000.wav		PIPPYG	100	61	0.610000	
		PIPPYG_20180724_224002_000.wav		PIPPYG	62	44	0.710000	
		PIPPYG_20180724_223949_000.wav		PIPPYG	55	41	0.745000	

This .csv file is available to view within the folder (file called 'id') where the data was originally stored prior to analysis.



It is quite likely that much of what is shown within the spreadsheet you will not wish to use for reporting purposes. To save time organising within excel later on, you can change what is shown and the order in how it appears at the front end of the process, as follows.

Go to 'file', and click 'Edit Columns'

	IN FILE	OUT FILE FS	OUT FILE ZC	AUTO ID	PULSES	MATCHING
11	NYCNOC_20180724_223348.wav	NYCNOC_20180724_223348_000.wav		NYCNOC	4	4
12	NYCNOC_20180724_223322.wav	NYCNOC_20180724_223322_000.wav		NYCNOC	2	2
13	NYCNOC_20180724_223358.wav	NYCNOC_20180724_223358_000.wav		NYCNOC	2	2
14	NYCNOC_20180724_223941.wav	NYCNOC_20180724_223941_000.wav		NYCNOC	6	6
15	NYCNOC_20180724_223634.wav	NYCNOC_20180724_223634_000.wav		NoID	4	0
16	NYCNOC_20180724_224023.wav	NYCNOC_20180724_224023_000.wav		NoID	5	0
17	PIPPYG_20180724_223242.wav	PIPPYG_20180724_223242_000.wav		NoID	61	0
18	PIPPYG_20180724_223638.wav	PIPPYG_20180724_223638_000.wav		NoID	25	0
19	PIPPYG_20180724_225531.wav	PIPPYG_20180724_225531_000.wav		NoID	6	0
20	PIPPYG_20180724_225549.wav	PIPPYG_20180724_225549_000.wav		NoID	55	0
21	PLEAUR_20180724_223825.wav	PLEAUR_20180724_223825_000.wav		NoID	6	0
22	PIPPYG_20180724_221938.wav	PIPPYG_20180724_221938_000.wav		Noise		
23	PIPNAT_20180724_225649.wav	PIPNAT_20180724_225649_000.wav		PIPNAT	68	59
24	PIPNAT_20180724_225718.wav	PIPNAT_20180724_225718_000.wav		PIPNAT	78	51

You will now be able to customise how data is shown ahead of it being saved as a .csv as previously described. There is a wide range of options here as to what to include (show) or exclude (hide), as well as the order in which you wish data to appear.

	FOLDER	IN FILE	OUT FILE FS	OUT FILE ZC	AUTO ID	PULSES	MATCHING	MATCH RATIO	MANUAL ID
1					EPTSER	29	3	0.103000	
2					NYCLEI	16	14	0.875000	
3					NYCLEI	11	10	0.909000	
4					NYCLEI	10	5	0.500000	
5					NYCLEI	7	4	0.571000	
6					NYCNOC	1035	344	0.332000	
7					NYCNOC	11	7	0.636000	
8					NYCNOC	5	5	1.000000	
9					NYCNOC	6	4	0.667000	
10					NYCNOC	3	2	0.667000	
11					NYCNOC	4	2	0.500000	
12					NYCNOC	2	1	0.500000	
13					NYCNOC	2	1	0.500000	
14					NYCNOC	6	3	0.167000	
15					NoID	4	0	0.000000	
16					NoID	5	0	0.000000	
17					NoID	61	0	0.000000	
18					NoID	25	0	0.000000	
19					NoID	6	0	0.000000	MYOMYS
20					NoID	55	0	0.000000	MYOMYS
21					NoID	6	0	0.000000	MYOMYS
22					Noise				MYONAT
23					PIPNAT	68	59	0.868000	MYONAT
24					PIPNAT	78	51	0.654000	MYONAT
25					PIPNAT	50	34	0.680000	PIPPYG
26					PIPPYG	170	61	0.359000	PIPPYG
27					PIPPYG	16	16	1.000000	PIPPYG
28					PIPPYG	2	1	0.500000	
29					PIPPYG	88	87	0.989000	
30					PIPPYG	95	75	0.789000	
31					PIPPYG	107	71	0.664000	
32					PIPPYG	71	70	0.986000	
33					PIPPYG	74	62	0.838000	
34					PIPPYG	100	61	0.610000	
35					PIPPYG	62	44	0.710000	
36					PIPPYG	55	41	0.745000	
37					PIPPYG	38	37	0.974000	

Important Note: If you plan to work with the data within a .csv file it is advisable to first of all save it as an excel spreadsheet before you start work. Otherwise the changes in layout etc. that you apply will almost certainly be lost.