Anabat Insight

User Manual

Titley Scientific

Version 1.0

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DOCUMENT HISTORY

Manual Version	Release Date	Software Version	Major Additions and Changes
1.0	01/02/18	1.0	-

CONTENTS

GLOSSARY

FFT Window	Fast Fourier Transform (FFT) relating to the time and frequency resolutions
Full Spectrum	A spectrogram which displays the sound frequency (y axis), time (x axis) and intensity (using colour)
GUANO	Metadata system; Grand Unified Acoustic Notation Ontology for bats
Metrics	Predefined measurements taken from the zero crossing analysis
Off Dots	Zero crossing dots which are hidden (either manually or by a filter)
Oscillogram	A visual representation of a sounds intensity (y axis) over time (x axis)
Pass	The series of pulses which are contained in a file, typically from one bat passing the microphone
Pulse	A single echolocation pulse emitted from a bat
Spectrogram	A visual representation of the spectrum of frequencies of sound as they vary with time
Trigger	A defined sensitivity level at which zero crossing or crest factor analysis occurs

FEATURES OF ANABAT INSIGHT

Anabat Insight is a viewing and reporting software package for sound files which perfectly complements bat call analysis. The program offers the following features:

- Ability to view recordings in full spectrum and zero crossing
- Project management to keep all your calls organised
- Metrics calculations for passes and individual pulses
- GUANO metadata support
- Customizable filters and scans
- Choose between multiple audio modes to listen to calls
- Inbuilt mapping to view tracks and file locations
- Supports open source Auto ID plugins (currently Bat Classify UK)
- Can be used on Windows or Mac

GETTING STARTED

The image below shows some of the main features and tools of Anabat Insight. To open Anabat Insight, double click on the ⌄ Anabat Insight icon on your desktop or program list.
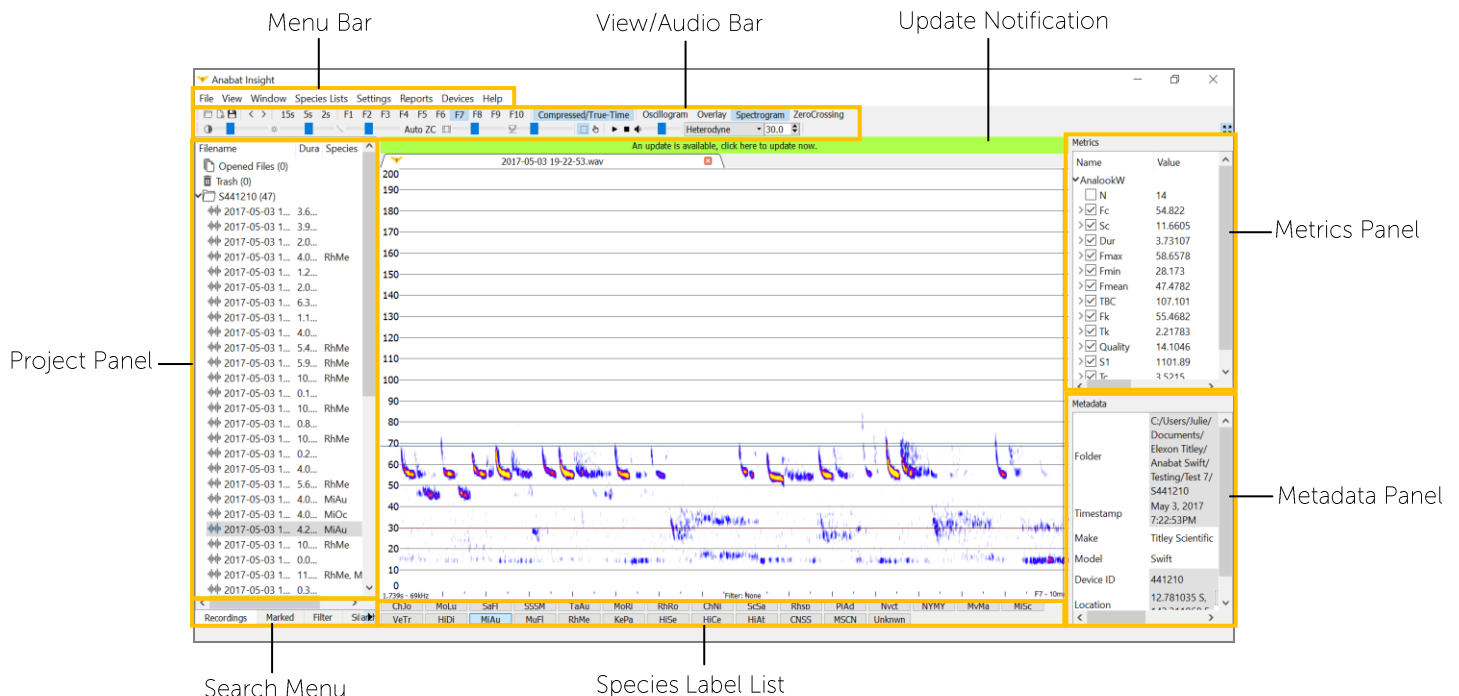
OPENING & CLOSING FILES

You may open entire folders (including subfolders), or single files.

OPENING & CLOSING A DIRECTORY (FOLDER)

To open a folder, click the ☐ in the **View/Audio Bar**, or click on **File**, then **Open Directory**. Navigate to the folder you wish to open, click on the folder, then press **Choose**. Alternately, you can navigate to the desired file, then double click on the file; this will open the folder which houses the selected file. Alternatively, you can drag and drop a folder, or files, directly into the program.

Once you have opened the folder, it will be displayed in the **Project Panel**. Click on **>** next to the folder to show the contents. Any subfolders will be displayed, and you can display/hide the contents of these folders by pressing the **>** next to the folder.

To close the directory, right click on one of the folders displayed in the **Project Panel** and click **Close Store**.

CREATING A PROJECT FILE

A project file will contain all of the files/folders you import. This will create a compressed version of your files (using less memory), and allow you to edit the files without altering the originals on your hard drive. To create a project file click on **File**, then **Create new Project File**. It will ask you to select an **Import Folder** which contains all your recordings, and a destination to save the project file to, then click **Next**. You can then choose to assign a name to each of the detectors identified in the data set, you do not need to complete this step, click **Next**. It will then create the project file, this may take a few minutes depending on how many files need to be imported. The project file will automatically be opened in the **Project Panel** when complete.

You can then view, analyse and edit your files as you would with a folder, but your original files will remain unaltered. **Please note that the Bat Classify plug-in cannot be run on project files.**

OPENING & CLOSING A FILE

To open single files, click on 📄 in the **View/Audio Bar**, or click on **File**, then **Open…**. Navigate to the file you wish to open, then either click on the file, then press **Open**, or double click on the file itself. You can also drag and drop a file directly into the program.

Once you have opened a directory and displayed the contents of the folder, the files will be displayed with an icon indicating their file type in the **Project Panel**:

         📶 Full Spectrum (.wav)

         ⋰ Zero Crossings (.zc)

         🗄 Project file (.apf)

         🦇 Species Group

         📝 Memos/Log Files/Other Files

To open a listed file, double click on the file in the **Project Panel**. The spectrogram will be displayed in the main panel, with the file name in a tab above the file.

To close the file displaying in the main panel, click on ❎ in the tab above the file.

To close single file/s from the directory, right click on **Open Files** in the **Project Panel**, then click **Close Store**.

VIEWING MULTIPLE FILES

To open another file, double click on the desired file in the **Project Panel**. The file will automatically open in a new spectrogram window. There will be a tab for each file displayed above the spectrograms, you can change between files by clicking on the corresponding tab.

To view multiple files at once, open two files in the **Project Panel**, click on Window, then select either **Cascade** or **Tile**. Cascade will show smaller windows on top of larger windows. Tile will display the windows next to each other, optimising the screen space.

SCROLLING THROUGH A FILE

Once a file is open in the main panel, you can scroll along the file in three ways:

- Hover the mouse pointer over the main panel display and use the scroll wheel on the mouse.
- Ensure 🖑 is selected in the **View/Audio Bar**, then use your mouse to click and drag the display left or right.
- Use the arrow keyboard shortcuts **< >** to scroll left or right.

OPEN NEXT/PREVIOUS FILE

Once you have opened a directory, you can scroll to next/previous files using the **< >** arrows in the **View/Audio Bar**, or you can use the keyboard shortcuts "**[**"and "**]**". To view all of the files in quick succession, hold down the "**[**" or "**]**" key.

Change speed

To change the speed that files are displayed when the "**[**"or "**]**" keys are held down, in the **Menu Bar** click on **Settings**, then **File Navigation**, then **Next/Prev Speed**. Select your desired speed.

OPEN LOG FILE

Log files can be found in the **Other Files** folder in the **Project Panel**. To view a log file, double click on the log file in the **Project Panel**. It will automatically open in the default program your computer is configured to use for that file type.

CUSTOMIZE YOUR VIEW

Anabat Insight offers a range of features to customize the display to suit your preferences.

DARK MODE

Dark mode will change the program panels to a dark colour, this may reduce eye strain. To change to dark mode, select **View** in the **Menu Bar**, then check **Dark Mode**. To return to the original light mode, uncheck **Dark Mode**.
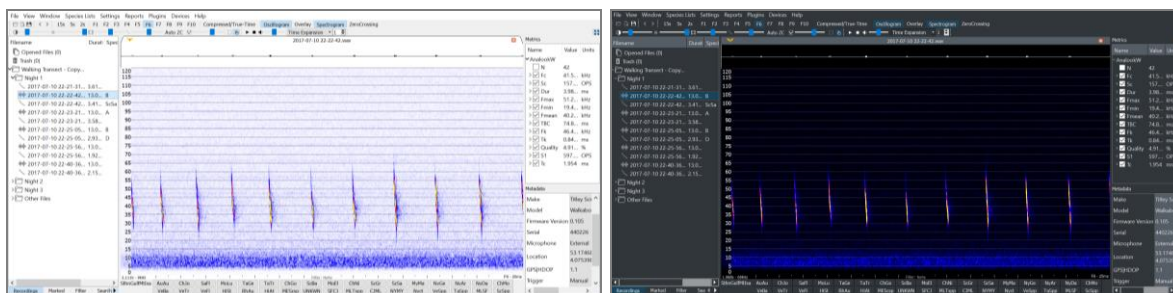
| Light Mode | Dark Mode |

FULL SPECTRUM, ZERO CROSSING & OVERLAY

You have a range of options to view your files. If you are opening zero crossing files, they can only be viewed in **Zero Crossing**. If you are opening full spectrum files, then you can choose between **Spectrogram**, **Zero Crossing**, both, or an **Overlay**. Please note that is you are viewing full spectrum files in Zero Crossing, you need to ensure the **ZC Sensitivity** is set correctly (see **Setting the ZC Trigger Threshold**). When both are displayed the spectrogram will be on the top, and the zero crossing graph at the bottom. When overlay is selected, the zero crossing dots will be overlaid on the spectrogram, To select your viewing mode, click on your preferred mode/s in the **View/Audio Bar**; alternatively you can click on **View** in the **Menu Bar**, then check your preferred mode/s.

OSCILLOGRAM

To display the oscillogram on full spectrum recordings, click on **Oscillogram** in the **View/Audio Bar**; alternatively you can click on **View** in the **Menu Bar**, then check **Oscillogram**. The oscillogram will be displayed above the spectrogram.

FREQUENCY SCALE

To change the frequency scale, right click anywhere on the spectrogram, then hover over **Frequency Scale**; alternatively you can click on **View** in the **Menu Bar**, then click on **Frequency Scale**. This will display some preset scales you can select from, or click on **Edit/New Scale**.

You can choose between **Linear** and **Logarithmic**, and set the minimum and maximum frequencies. To save your custom frequency scale, type a **Name**, then click **Save**. Your saved custom scales will be available to select from in the **Frequency Scale** menu.

Changing frequency axis lines

In addition to changing the frequency axis, you can choose where the frequency axis lines should be placed. To do this right click anywhere on the spectrogram, then click on **Frequency Lines**.

To create a new customized frequency line list, click **Add List**, then double click on the **<new list 1>** and type in your preferred list name. Click in the **Current List** box (see image below) and type in your preferred axis lines, pressing Enter after each entry. Click **Save** when you have completed the list. To return to the default frequency lines, click on **Auto**. Click **Close** to return to viewing spectrograms with your selected frequency line list.
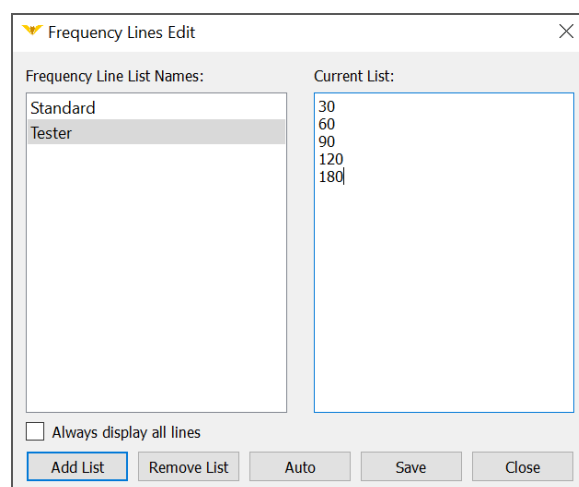
TIME SCALE

Standard Time Scales

You can select between pre-set timescales in the **View/Audio Bar**, displayed as the buttons **F1 to F7**. The time scales referred to the amount of time displayed between tick marks (divisions) on the time axis. You can also choose between **15s**, **5s** and **2s**, which represent the number of seconds per 40 pixels. It should be noted that compressed mode does not affect the time scale.

F1 – 1 second	**F6** – 25 milliseconds
F2 – 0.5 seconds	**F7** – 10 milliseconds
F3 – 0.25 seconds	**F8** – 5 milliseconds
F4 – 0.1 seconds	**F9** – 2.5 milliseconds
F5 – 50 milliseconds	**F10** – 1 millisecond

COMPRESSED & TRUE-TIME MODE

You can choose to view your files in either True-Time or Compressed mode. True-Time will display the entire contents of the file, whilst Compressed mode will remove the 'spaces' between pulses. In Compressed mode Anabat Insight will display pulses based on your trigger settings, so ensure these are configured correctly. Files will be displayed in True-Time by default, to change to Compressed mode, click on **Compressed/True-Time** in the **View/Audio Bar**. When Compressed mode is selected, the button will be highlighted. You can use the keyboard spacebar shortcut to toggle between Compressed and True-Time modes.

Selecting Trigger Mode

A trigger is used to define when a bat call occurs. It is used in compressed mode, for rendering the Zero Crossing graph from full spectrum file, and for calculating all metrics. Click on **Settings** in the **Menu Bar**, then click on **Trigger**, this will open the **Trigger Settings Menu**. To select your trigger mode, click on the dropdown menu next to **Compression Trig** and choose between **Zero Crossing** and **Crest Factor**.

Crest Factor Trigger: The Crest Factor Trigger works by only triggering when the difference between the background noise level and the level of the loudest frequency

exceeds the set level. In practice this means that the trigger will only respond to loud, narrowband sounds that are above the background noise.

Zero Crossing Trigger: The Zero Crossing trigger occurs every time the incoming signal crosses a preset amplitude level (sensitivity). This level is adjusted so that quiet sounds (background noise) don't cause a trigger event, but loud sounds like bat calls do. This setting must be configured correctly to view full spectrum files as zero crossing graphs, and to calculate the metrics.

Auto ZC Trigger Threshold

You can select Auto ZC threshold which will attempt to automatically determine the optimum level for every individual file. To select this mode, click on the **Auto ZC** button next to the ZC slider in the **View/Audio Bar**. We suggest using the Auto ZC by default, if this doesn't produce the results you are looking for then try manual trigger setting.

Setting the ZC Trigger Threshold

To set the ZC Trigger Threshold, ensure Zero Crossing is your selected trigger mode. The ZC Trigger Threshold is controlled using the ⬏ slider bar in the **View/Audio Bar** (see below).

As you drag the slider bar, a corresponding number will be displayed in the bottom left of the program (eg. Adjust Zero Crossing Threshold: 12). To choose an appropriate threshold, open a file containing a bat pass then view the file in compressed mode. As you drag the slider, you will see more or less of the pass displayed, choose a level which displays all the pulses you deem necessary to see with as little noise as possible. This may not need to be reassessed for each file, but different detectors will need different settings.

Crest Factor Trigger Threshold

To set the Crest Factor Trigger Threshold, ensure Crest Factor is your selected trigger mode. The Crest Factor Trigger Threshold is controlled using the ⩗ slider bar in the **View/Audio Bar** (see below). Crest Factor is not used for zero crossing display, only compressed mode when view full spectrum files.

As you drag the slider bar, a corresponding number will be displayed in the bottom left of the program (eg. Adjust crest factor threshold: 10).

GRAPH COLOURS

To change the graph colours, right click anywhere on the spectrogram, then click on **Graph Colours**; alternatively you can click on **View** in the **Menu Bar**, then click on **Graph Colours**. You can change the colours of the background (black and white), oscillogram, spectrogram colour map, ZC dot, ZC body and Off Dots. ZC dots refer to the dots rendered by the zero crossing analysis, the ZC Body refers to the dots which are determined to be the 'call body' for metrics, and the Off Dots are the dots hidden by a filter (or manually). In addition you can change the ZC Dot Size. Select your preferred colours and click on **Save**.

BRIGHTNESS & CONTRAST

You can change the brightness and contrast of the full spectrum spectrograms using slider bars in the **View/Audio Bar**. The ◑ slider controls the contrast, and the ☀ slider controls the brightness. As you drag the slider bar, a corresponding number will be displayed in the bottom left of the program (eg. Adjust spectrogram brightness: 85). This may assist in viewing faint calls, or increasing call clarity, you may need different settings for each file.

FFT WINDOW SIZE

The ⊟ slider allows you to set the 'window size' of the Fast Fourier Transform (FFT). This setting is a trade-off between time resolution and frequency resolution. A smaller window will produce more accurate results in timing, at the expense of precision of frequency representation. A larger window will provide a more precise frequency representation, at the expense of precision in timing representation. Large FFT windows will also be slower to process. Typically a larger window will be better for viewing constant frequency bat calls and a smaller window is better for frequency modulated bat calls. As you drag the slider bar, a corresponding number will be displayed in the bottom left of the program (eg. Adjust FFT Window: 10).

You can choose to limit the FFT window width to powers of 2, which will speed up the rendering of spectrograms. To do this, click on **Settings** in the **Menu Bar**, hover over **FFT Window Settings**, and check **Limit FFT width to powers of 2**.

HIGHLIGHT CALL BODY

When your files are displayed in zero crossing, you can choose to highlight the call body to display what the program is identifying as the 'body' of the pulses. See below for a file with and without the call body highlighted.
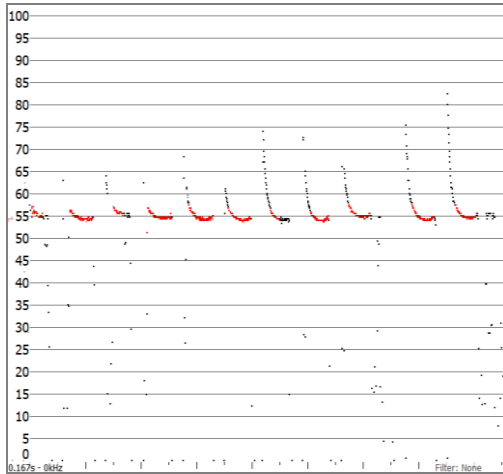
Call Body Highlighted   **No Highlight Call Body**

To highlight the call body, right click on the spectrogram and click on **Highlight Call Body**. Alternatively, you can use the keyboard shortcut of '**m**'. To change the colour of the highlighted dots, see **GRAPH COLOURS**.

VIEW SLOPE GRAPH

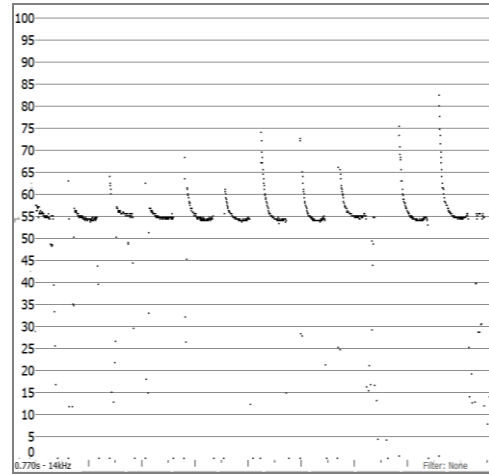The slope graph is calculated from the zero crossing analysis, it will display the speed at which the call changes pitch over time, and is shown in octaves per second. To view the slope graph, click on **View** in the **Menu Bar**, then click on **Slope**. To change slope settings, see **SLOPE TRANSITION SETTINGS**.

VIEW CYCLES GRAPH

The cycles graph is calculated from the zero crossing analysis, it will display a graph of the frequency (kHz) against the energy (based on the amount of time spent in each frequency band). To view the cycles graph, click on **View** in the **Menu Bar**, then click on **Cycles**. To change cycle settings, see **CYCLE SETTINGS**.

METADATA

All new Titley Scientific detectors record metadata in the GUANO (Grand Unified Acoustic Notation Ontology) format. This format is now the standard across bat acoustic fields.

VIEWING METADATA

The metadata associated with each file is displayed in the **Metadata Panel**. This may include:

- Folder location (not stored in the metadata, but visible in the Metadata Panel)
- Timestamp
- GPS location
- Detector make and model
- Detector firmware version
- Detector ID (serial number)
- Microphone input
- Temperature and humidity at time of recording
- Trigger settings
- Species labels

CREATING AND CHANGING METADATA

In addition to the metadata which was recorded by the detector, you can also add custom metadata. To add a custom metadata field, open a file and scroll to the bottom of the **Metadata Panel**. Click in the field panel to add a field title, eg. Weather, or Site. Then click in the entry box and type in the metadata entry, eg. Raining, or National Park. When you scroll to the next file, it will ask you if you would like to save the changes. You can also check the box to save without asking in future. If you click **Save**, the metadata will be saved with your file.

To change a custom metadata field or entry, just click on the corresponding entry and retype it.

REMOVING METADATA

You can batch-remove metadata from multiple files, including species labels. To do this, select the relevant files in the **Project Panel**, right-click on the files and select **Remove Metadata**, a dialog box will appear. You can select the metadata type and value from the drop-down boxes to be removed, click **Remove**, this will add the batch removal process to the dialog box. You can add multiple metadata removals to one batch. To complete the removal, click **OK**.

METRICS

Anabat Insight calculates a range of metrics for your files, based on the zero crossing analysis. The trigger settings must be correct for metrics to be accurately measured. These metrics are displayed in the **Metrics Panel** and include:

N – This is not a metric, but the number of pulses detected for metrics in the file.

Fc – Characteristic Frequency; the frequency (kHz) at the right hand end of the portion of the call with the lowest absolute slope (the body).

Sc – Characteristic Slope; the slope of the body of the call, measured in Octaves per Second (OPS).

Dur – Pulse Duration; the duration of the pulse, measured in milliseconds (ms)

FMax – The maximum frequency (kHz) of the pulse.

FMin – The minimum frequency (kHz) of the pulse.

FMean – The mean frequency; which is a weighted mean, $F_{Mean} = (N - 1)D/2d$, where N is number of points counted in the display, D is the division ratio and d is the duration of the call.

TBC – Time between calls; the time from the start of one pulse until the start of the next pulse.

Fk – Frequency of the knee; frequency (kHz) of the junction (point of greatest change in slope) between the initial and pre-characteristic sections

Tk – The time from the start of the call to the knee, measured in milliseconds (ms).

Quality – The average smoothness for the whole call. Smoothness is the absolute value of the difference between the frequency of any point and the average of the frequencies of the points either side of it, divided by the frequency of that point. These values are summed over the whole call, and the result divided by the number of intervals in the call (number of dots minus 1).

S1 – The slope of the first five points in a pulse, measured in Octaves per Second (OPS).

Tc – The time from the start of the call to the characteristic section, measured in milliseconds (ms).

VIEWING METRICS

Pass Metrics

The **Metrics Panel** displays the average metrics for the pass displayed (only what is visible on the screen). If you change the display (for example the time axis), or move the call, then the metrics will change to reflect the average for what is displayed on the screen.
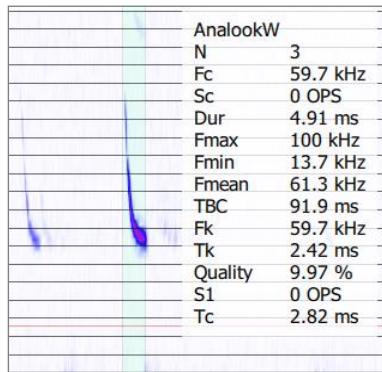
Name	Value	Units
∨AnalookW		
☐ N	31	
>☑ Fc	57.8411	kHz
>☑ Sc	53.707	OPS
>☑ Dur	3.28067	ms
>☑ Fmax	75.6877	kHz
>☑ Fmin	25.662	kHz
>☑ Fmean	53.8101	kHz
>☑ TBC	84.4288	ms
>☑ Fk	58.7644	kHz
>☑ Tk	1.88758	ms
>☑ Quality	13.0195	%

Pulse Metrics

To view the metrics for individual pulses, click on the drop down arrow next to the metric of interest, and a list of pulses in the file will be shown, along with the metric for each individual pulse. The metrics which are greyed out are from pulses which are not currently being displayed. To remove erroneous pulse metrics from the pass average, simply uncheck the box next to that metric. To view which pulse is associated with the metric, click on the metric and the call will be displayed with the pulse of interest on the left of the display. To uncheck, or recheck all of the pulse metrics, check/uncheck the box next to the average metrics.

Name	Value	Units
∨AnalookW		
☐ N	23	
∨☑ Fc	57.727	kHz
☑ 1	57.142	kHz
☑ 2	56.338	kHz
☑ 3	59.701	kHz
☑ 4	57.142	kHz
☑ 5		kHz
☑ 6	57.142	kHz
☑ 7		kHz
☑ 8	58.823	kHz
☑ 9	56.338	kHz

Alternatively you can right click on the spectrogram and check **Show call metrics**. Then as you hover your mouse pointer over pulses, the metrics for that pulse will be displayed.

AnalookW	
N	3
Fc	59.7 kHz
Sc	0 OPS
Dur	4.91 ms
Fmax	100 kHz
Fmin	13.7 kHz
Fmean	61.3 kHz
TBC	91.9 ms
Fk	59.7 kHz
Tk	2.42 ms
Quality	9.97 %
S1	0 OPS
Tc	2.82 ms

LISTENING TO FILES

Bat calls are typically ultrasonic and outside of the human hearing range, Anabat Insight offers a variety of audio modes which will make the ultrasonic calls audible.

AUDIO MODES

You can choose between Heterodyne, Pitch Shifting, Comb Filter, Frequency Division and Time Expansion.

Heterodyne: This mode shifts down a portion of the ultrasonic band into the human hearing range by mixing the signal with an internal reference frequency. This reference frequency is adjusted by the user to suit the frequency of bat calls of interest. The bandwidth of the heterodyne mixing is about ±8 kHz, so bats calling at a significantly different frequency to the reference frequency will not be heard.

Pitch Shifting: This mode compresses the ultrasonic spectrum down into an audible band by shifting the pitch of the sound. Harmonic components and amplitude of the bat calls are kept in this process.

Comb Filter: This mode can be thought of as multiple heterodyne detectors operating simultaneously, all tuned to different frequencies to cover more of the ultrasonic range.

Frequency Division: This audio mode divides down frequency of the incoming ultrasonic signal by a preset ratio (typically 16) so as to allow ultrasonic sounds to be heard by the human ear. This mode is based on zero-crossing and thus only the loudest frequency component will be heard. No harmonics can be heard and the amplitude of bat calls is not retained, so all sounds will be of the same volume level.

Time Expansion: This mode works by playing back a recorded sound at a slower than normal speed (typically 1/10th). This has the effect of lowering the frequency of the sound. All amplitude and frequency components are retained.

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To select your preferred audio mode, click on the audio drop down menu in the **View/Audio Bar**. If you select Pitch Shift, Heterodyne, Frequency Division or Time Expansion and addition menu will appear next to the audio mode. This can be used to tune or control the audio playback, for example in Time Expansion you will select the time expansion factor. You can then use the audio controls to ▶ play and ■ stop the audio. The volume bar controls the volume of the audio playback.
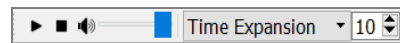
To play the call from a specific start point, ensure the oscillogram is displayed above the spectrogram. Then click at the desired start location in the oscillogram then press ▶.

SPECIES LISTS AND LABELING FILES

Anabat Insight allows you to create or import species lists to label files. Lists created in AnalookW can be opened directly in Anabat Insight.

CREATING A SPECIES LIST

To create a new species list, click on **Species Lists** in the **Menu Bar**, then click on **New/Edit**. Select **Add List** then type your list name (eg. Southern Region). Click in the **Species** column and type in your species, one label per line (see below). Click **Close** when complete.
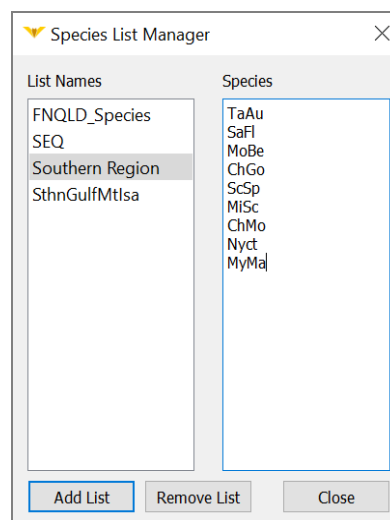
To remove or edit a species list, open click on **Species Lists** in the **Menu Bar**, then click on **New/Edit**. Select the preferred list and double click to change the list name, or click on the species in the species column to edit, or click **Remove List** to delete the selected list.

OPENING & DISPLAYING A SPECIES LIST

To display a species label list, click on **Species Lists** in the **Menu Bar**, check the desired species list/s, then check **Show Species Labels**. Your selected list/s should now be displayed below the spectrogram.

LABELLING A FILE

To apply a species label to a file, with the file open in the spectrogram window, click on the desired species label from the list. You can add more than one label per file. When you move to the next file, a prompt will appear to ask if you would like to save your changes, click the **Save** button to save your species label to the metadata of the file. The species label will be displayed next to the file duration in the **Project Panel**, and also in the **Metadata Panel**. To remove a species label from a file, click on the label in the species list with the file open. Alternatively, you can batch remove species labels, see **REMOVING METADATA**.

MARKING FILES

In Anabat Insight, you can mark files to perform actions on later such as view, export, view in external application, add metadata or send to trash.

MARKING A FILE

To mark a recording you can right click on the recording filename in the **Project Panel**, then select **Mark Recording**. Alternatively, if the recording is open in the spectrogram window you can use the keyboard shortcut **X** or **Alt M**. To unmark a recording, either use the keyboard shortcut again, or right click on the file and select **Unmark Recording**. You can also mark/unmark multiple files by selecting more than one file in the **Project Panel**.

VIEWING MARKED FILES

To view your marked files, click on the **Marked tab** at the bottom of the **Project Panel**. A list of marked files will be displayed, which you can open and scroll through.

EXPORT OR DELETE MARKED FILES

To perform actions on marked recordings, select the recordings in the **Marked tab** (to select all, click one recording, then press CTRL+A), then right click; this will display the options menu.

- To **view** the marked files, click **Open Selected**. The files will be displayed as tabs in the spectrogram window.
- To **copy/move/export to zero crossing**, click **Export Selected** and follow the prompts.
- To **view the files in their folder**, click **Show in File Explorer**.
- To **open the files in another application** of your choice, click **Show in External Application**.
- To **delete** the files, click on **Send to Trash**. This will send the selected recordings to the trash, you will need to empty the trash to permanently delete the recordings.
- To **unmark** recordings, click **Unmark Recordings**.
- To **add metadata**, click **Add Metadata**, then enter the Type (eg. weather), then Value (eg. raining). Click **OK**.
- To **add a species label**, hover over **Add Species**, then select the appropriate species label. If no species are displayed, ensure you have selected a species list (see **OPENING & DISPLAYING A SPECIES LIST**).

FILTERS

Filters can be used in a number of ways to streamline your analysis. You can use filters to compress your files to only view pulses of interest, remove noise from view, observe which pulses in a file meet certain metric conditions, search for certain species/pulses in a dataset, and build custom decision trees for auto-identification. It is important to ensure that the trigger is set correctly for filters to work well.

LOADING A FILTER

To load a pre-existing filter, click on the **Filter tab** under the **Project Panel**. Click on 🗁, then select your filter. Anabat Insight can load filters created in AnalookW. Once a filter is loaded, the metrics will be displayed. Anabat Insight will remember your recently used

filters, to load a recent filter, click on the **Recent Filters** drop-down menu and select the relevant filter.

CREATING A FILTER

To create a filter, click on the **Filter tab** under the **Project Panel**. Click on ▢ to begin creating a new filter. Enter the range of metrics, ensuring the filter is enabled ✅ and the relevant metrics are checked ☑. As you enter the metrics, you can observe what is passing the filter on the spectrogram if you have selected either compressed mode or highlight call body (see **VIEWING WITH A FILTER**). To save the filter, click 💾 and follow the prompts.

EDITING A FILTER

To edit a filter, first load the filter you wish to change, then alter the relevant metrics. You can then save these changes by clicking 💾, or save the changes as a new filter by clicking 💾.

VIEWING WITH A FILTER

There are three ways you can view a filter working: 1) compressed mode, 2) highlight call, and 3) zero crossing.

1) **Compressed mode**. This will remove the gaps and pulses which do not meet the filter parameters from the display. Select **Compressed** mode, and ensure your filter is enabled.

2) **True Time mode**. This will highlight the pulses which pass the filter (in green or red). First ensure you are in **True Time** mode, and then ensure the **Highlight Call** box is checked in the Filter tab.

3) **Zero crossing**. This view is best when you want to remove noise from the display, because the dots which do not pass the filter are hidden. When a filter is applied and you view the call in zero crossing mode, all of the erroneous noise dots which do not pass the filter are not displayed.

SMOOTHNESS FILTERS

There are built-in smoothness filters which can be applied to your calls to help remove noise and poor quality pulses. Smoothness is calculated by looking at adjacent dots and seeing how smoothly connected they are. Ideally the 3 (previous, current and next) dots will make a straight line for perfect smoothness, but you can set the threshold on how 'smooth' or 'line-like' they need to be. To select a built-in filter, click on **View**, then **Smoothness**. Select the level of smoothness filter (from 0 to 9).

SEARCHES & DECISION TREES

You can use the search tool to search for files in your dataset based on a filter, or on the metadata. The decision tree tool can be used to create a customisable key to analyse your calls. For example, you can use the search tool to search for any files recorded in a particular date range, or to search for all the files which pass an "All bats" filter.

CREATING A SEARCH

To begin, click on the **Search tab** under the **Project Panel** (see below), and ensure the **Search** button is selected. Select the **Recording Store** you would like to search using the drop down menu. Choose your **Criteria Type** using the drop-down menu (eg. filter, species, time, date, device ID). Parameter windows relating to your criteria will appear. Then use the **Accept** drop-down menu to select whether you want to see results which match your criteria, or do not match. Then click **Add**.
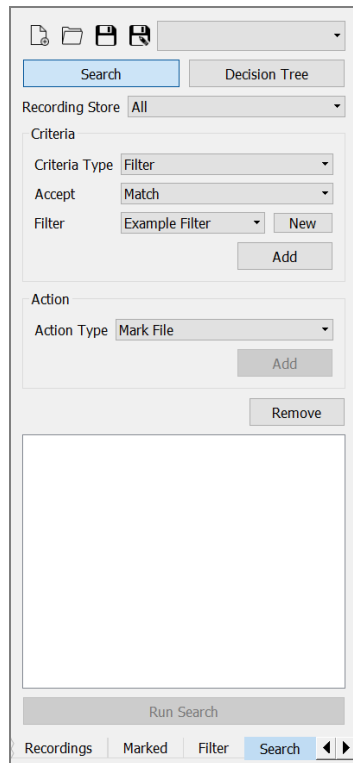
Your search criteria will appear in the search box, you can add multiple search criteria to one search. Then click **Run Search**, this will take you to the **Results tab**, where all the files which pass your search criteria are displayed.

You can save search parameters to use again another time by clicking 💾. To load a search you have previously saved, click 📁.

CREATING A DECISION TREE

A decision tree is a tool which passes files through a dichotomous tree. Each file either 'passes' or 'fails' criteria, before moving down to the next branch of the decision tree. At each branch of the decision tree you can assign actions. You can use this tool (in combination with filters) to create your own Auto-ID tree.

To begin, click on the **Search tab** under the **Project Panel**, and ensure the **Decision Tree** button is selected. Select the **Recording Store** you would like to search using the drop down menu.

Start with the first branch of the decision tree. Choose your **Criteria Type** using the drop-down menu (eg. filter, species, time, date, device ID). Parameter windows relating to your criteria will appear. Then use the **Accept** drop-down menu to select whether you want to

see results which match your criteria, or do not match. Then click **Add**. You will see several lines appear in the search box:

```
✓  If Pass filter X
        None...
>  Else
```
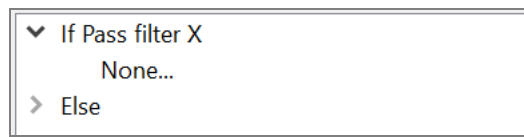
If you would like to add a second branch, or action, to the files passing the first criteria, then click **None** below the first "**If Pass**...", then you can add an action or another search criteria. If you would like to add a second branch, or action, to the files which fail the first criteria, click the drop-down arrow next to **Else**, click **None**, then you can add an action or another search criteria. Here is an example tree:

```
                        ┌──────────────┐
                        │   Filter X   │
                        └──────────────┘
               Pass    /                \    Fail
                      /                    \
          ┌──────────────┐          ┌──────────────┐
          │   Filter Y   │          │ Send to Trash│
          └──────────────┘          └──────────────┘
      Pass  /          \  Fail
           /            \
  ┌──────────────┐  ┌──────────────┐
  │ Label Rhsp   │  │   Filter Z   │
  └──────────────┘  └──────────────┘
```
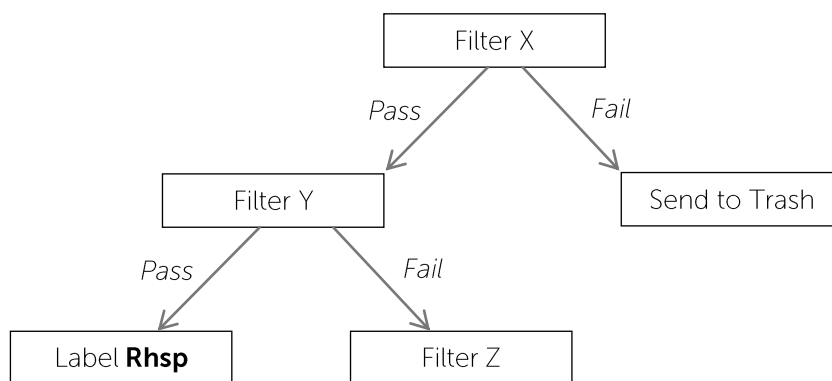
The decision tree above would look like the following in the search box:

```
✓  If Pass filter X
    ✓  If Pass filter Y
            Action: Add Species Rhsp
            None...
    ✓  Else
        ✓  If Pass filter Z
                None...
        >  Else
✓  Else
        Action: Move to Trash
        None...
```

Then click **Run Search**, this will take you to the **Results tab**, where all the files from the selected store are displayed under the branch node where they end.

You can save a decision tree by clicking 💾. To load a decision tree you have previously saved, click 🗁.

VIEWING SEARCH & DECISION TREE RESULTS
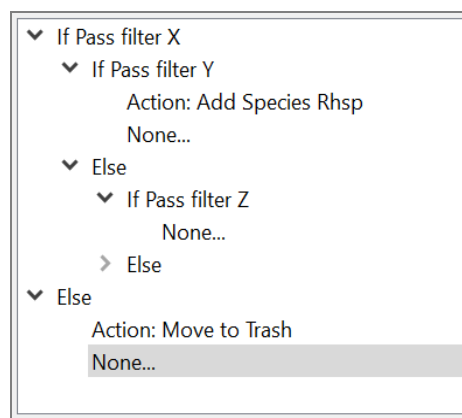
Your search or decision tree results are shown in the **Results tab** under the **Project Panel**. You can open a file by double clicking on it in the list. Then when you scroll through files using **[** and **]**, you will be scrolling through the search results. You can also open/export/delete/add metadata to the recordings. Simply select the recordings (to select all, click one recording, then press CTRL+A), then right click; this will display the options menu.

- To **view** the result files, click **Open Selected**. The files will be displayed as tabs in the spectrogram window.
- To **copy/move/export to zero crossing**, click **Export Selected** and follow the prompts.
- To **view the files in their folder**, click **Show in File Explorer**.
- To **open the files in another application** of your choice, click **Show in External Application**.
- To **delete** the files, click on **Send to Trash**. This will send the selected recordings to the trash, you will need to empty the trash to permanently delete the recordings.
- To **mark** recordings, click **Mark Recordings**.
- To **add metadata**, click **Add Metadata**, then enter the Type (eg. weather), then Value (eg. raining). Click **OK**.
- To **add a species label**, hover over **Add Species**, then select the appropriate species label. If no species are displayed, ensure you have selected a species list (see **OPENING & DISPLAYING A SPECIES LIST**).

ADDING ACTIONS TO SEARCHES AND DECISION TREES

The following actions can be added to a Search or Decision Tree:

- Mark file
- Move to trash
- Add species
- Add note
- Add humidity
- Add temperature
- Add light
- Add custom metadata

To add an action, first enter the search/decision tree criteria, then select an **Action Type**. A relevant action box will appear to select the specific action (eg. choose a species label). Click **Add**, and the action will appear beneath the search criteria in the **Search Box**. You can add different actions for different search criteria. When you save a search, the actions will also be saved.

FILE EDITING

You can edit a file by cropping it, or in the case of zero crossing files you can also Hide/Show ZC Dots, and Show Off Dots. You can use the Hide ZC Dots to improve the metric calculations by removing erroneous dots.

CROP A FILE

To crop a file, choose the box select tool ⬚ from the **View/Audio Bar**. Then draw a box over the area you wish to crop on the spectrogram. Right-click on the spectrogram and select **Crop File**. **Please note: this will only crop the time scale, not the frequency.** The cropped file will appear as a new file tab in the spectrogram window. To save the cropped file, click 💾 in the **View/Audio Bar**. The original file will be preserved in the original tab in the spectrogram window.

HIDE/SHOW ZC DOTS

To hide/show ZC dots, ensure you are viewing the file in **Zero Crossing**, and choose the box select tool ⬚ from the **View/Audio Bar**. Then draw a box over the dots you wish to hide/show on the display. Right-click and select either **Hide ZC Dots** or **Show ZC Dots**, a window will appear to ask if you would like to edit the file temporarily or save a copy of your changes.

To reset the dots to the original file, right-click on the display and select **Reset All Dots**.

SHOW OFF DOTS

When you have a smoothness or saved filter applied to a file, or have hidden ZC dots, you can choose to show the Off Dots (the hidden dots) in a different colour (see Figure below,

with Off Dots in red). This may be helpful to check if bat pulses are being filtered out. To show Off Dots, right-click on the display and select **Show Off Dots**. To change the colour of the Off Dots, see **GRAPH COLOURS**.
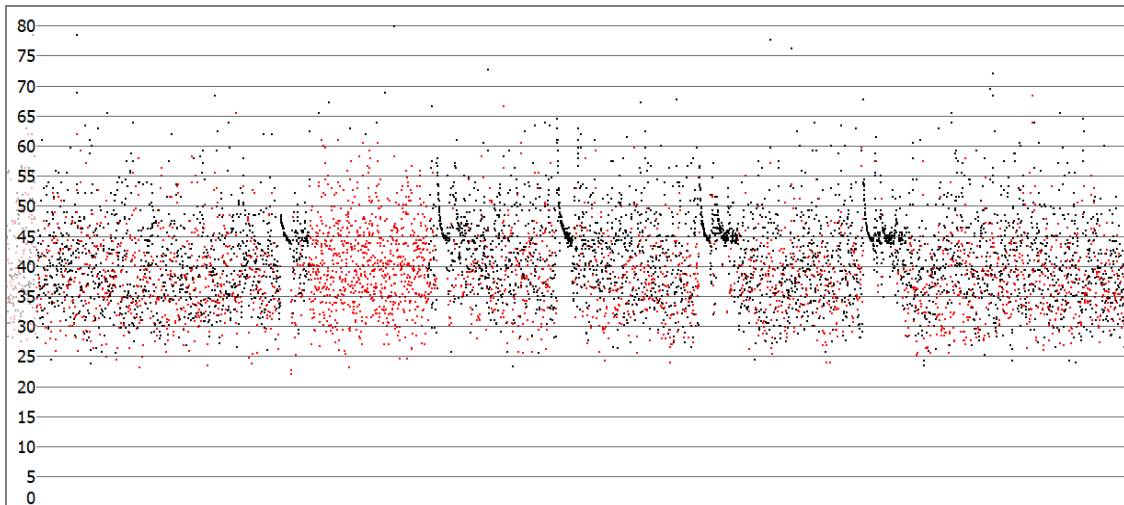
SAVE AN IMAGE

You can choose to save the spectrogram window as an image (.png). Simply right-click on the spectrogram, select **Save as Image**, and choose the destination folder for the image.

SETTINGS

The settings menu allows you to change the **Trigger** (see **Selecting Trigger Mode**), reset the program to default settings, change the slope transition and cycle settings, choose a file navigation speed (see **Change speed**), and limit the FTD Window width (see **FFT WINDOW SIZE**).

SLOPE TRANSITION SETTINGS

The slope transition settings refer to how many transitions the slope graph uses to display data. The transitions are in practice an averaging of the zc period dots whilst accounting for their division ratio. For example a 80 transition setting, with division 8 zc periods, would average 5 periods for a single slope point. To change your slope settings, click on **Settings** in the **Menu Bar**, then hover over **Slope Transitions** and then choose between **40**, **80**, **160**, or **320**.

CYCLE SETTINGS

The cycle settings refer to how many dots are averaged for one data point in the cycle graph. To change your cycle settings, click on **Settings** in the **Menu Bar**, then hover over **Cycle Settings** and then choose between **1**, **3**, or **5**. In addition, you can check Cycle Dots/Time, which changes whether the cycles graph is showing total dots or total time.

RESET SETTINGS

If you would like to reset all settings to the factory default, click on **Settings** in the **Menu Bar**, and then click **Reset Settings**. This will not close your store, or change any pre-existing Search/Results.

REPORTS

Anabat Insight currently offers a number of reporting features, and more will be added in future. To generate a report, click on **Analysis** in the **Menu Bar**, then click **Generate Reports**.

Select the data store which you would like to generate a report for; all (everything in the store), opened files (files which are individually listed in the **Opened Files** section of the **Project Panel**), or specific folders. You can then choose which type of report to generate:

- **Metrics**: Generates a .csv file which shows the average metrics for each file.
- **Species Count**: Generates a .csv file displaying each of the species identified in the dataset and how many files attributed to each species. You can choose to break the species counts up into time periods (1, 5, 10, 15, 30mins, and 1hr), and also group counts based on metadata (folder, night, device ID etc.)
- **Metadata Extract**: Generates a .csv file showing each file, and the selected metadata associated with that file (species, location, temperature etc.)
- **KML Map**: Generates a .kml file containing all of the GPS information in the selected store, including waypoints and tracks. Each file is stored in the KML file with species labels. This file can be opened by Google Earth or any GIS application.
- **Disperse Report**: Generates an .anl (Anabat List File) displaying each file and a count of the species labels contained in the file. This file can be opened in Microsoft Excel as a TSV file.

MAPPING

Anabat Insight comes with built-in mapping features using Open Street Maps and the ability to export GPS data.

To view where a file was recorded, open the file from the **Project Panel**, once the file is open in the spectrogram window, click on 📍 in the **Metadata Panel** next to **Location**. This will open a new tab in the spectrogram window, showing the location the file was recorded.

To view a .gpx track, double-click on the track in the **Project Panel** (it is shown under **Other Files** by default). This will open a new tab in the spectrogram window, showing the track on the map.

To view all the GPS data in a folder (waypoints and tracks), right-click on the folder in the **Project Panel**, select **Show On Map**. Files will be shown as 📍, and the track will be displayed in green on the map. To export the GPS data to a .kml file, see **REPORTS**.

To view a file from the map, click on the corresponding 📍, a grey header bar will appear at the top of the map listing the file name/s, select **Click to Open**. The selected file will open as a new tab in the spectrogram window.

DEVICES

This menu lets you access functions for certain detectors, refer to detector user manuals for more details.

SOFTWARE VERSION & UPDATES

Anabat Insight is regularly updated to improve features, and address any issues. If you do find a problem, please report it to us, and include the software version you are using.

CHECK THE SOFTWARE VERSION

To check which version you are running, click on **Help** in the **Menu Bar**, then click **About**. A dialog box will open displaying the version number.

CHECK FOR UPDATES

If you are connected to the internet, Anabat Insight will automatically check for updates. If there is an update available, a green bar will appear above the spectrogram window stating "**Update Available. Click to Update**". To update, click on the green bar and follow the prompts.

INSTALL YOUR LICENCE

If you have purchased a full licence for Anabat Insight, you will need to enter your licence activation key. To do this, click on **Help** in the **Menu Bar**, then click **Licence Management**, enter your activation key and click **Activate**. You must be connected to the internet to activate your licence.

KEYBOARD SHORTCUTS

There are a range of keyboard shortcuts you can use with Anabat Insight to streamline your analysis.

Display

Escape	Reset to default display
Space	Toggle true/compressed mode
M	Toggle call body on/off

Horizontal zoom (time per tick)

F1	1s (zoomed out)	F6	25ms (optimal)
F2	500ms	F7	10ms
F3	250ms	F8	5ms
F4	100ms	F9	2.5ms
F5	50ms	F10	1ms (zoomed in)

Filters

Alt+ 1…9	Load built-in noise filters 1 to 9
Alt+ 0 or Page Down	Clear filter
Page Up	Load previous filter
Z	Increase call smoothing only
Shift+ Z	Decrease call smoothing only

Marking Files

Alt+ M	Mark/unmark current file
X	Mark/unmark current file

Navigation between and within files

Q or [	Go to previous file
W or]	Go to next file
-	Go to previous marked file
+	Go to next marked file
Shift+ [	Go to previous labelled file
Shift+]	Got to next labelled file
◄	Go to previous trigger
►	Go to next trigger
A, S, D, F	Jumps forward along time axis: A ⅛, S ¼, D ½, F full screen width
HOME	Jump to start of file
END	Jump to end of file

TROUBLESHOOTING

I can't get the red highlight bar to appear.

First, check that you are in **COMPRESSED &** TRUE-TIME MODE; second, ensure the **filter is enabled**; thirdly, ensure **VIEWING WITH** A FILTER is checked in the filter tab. Also try checking other files, just in case the file you are viewing doesn't have any elements which pass the filter.

Compressed mode isn't working

The most likely reason it appears compressed mode isn't working is because the ZC sensitivity is too high, try **lowering the sensitivity**, **using the Auto ZC Trigger** Threshold or **changing the trigger settings**. If these are set correctly and compressed mode is still not working, try **applying a built-in smoothness filter** or create a noise filter.

Filter doesn't seem to be working

Firstly, ensure the **filter is enabled**, then ensure the relevant filter metrics are checked. Also make sure you are using a **suitable filter viewing mode**.

FAQS

Q. What is the difference between the free version and full licence?

A. All of the features in a full licence are available in the free version; the only difference is that the full licence allows you to open/view/analyse files from any detector (including non-Anabat detectors).

FURTHER INFORMATION

For further information please visit the Titley Scientific website: www.titley-scientific.com