Quoll-ID

User Guide

v1.22

The Quoll Identification Toolkit (QIT) software provides a semi-automated toolkit to facilitate the identification of individual quolls from camera trap image sequences. The use of the QIT will aid reliable identification of individual animals for quoll monitoring programs.

Contents

1. Installation Guide

Please **click** on the link https://github.com/lawchr/quollid/releases/download/v1.0.22/Quoll-ID-1.0.22.exe

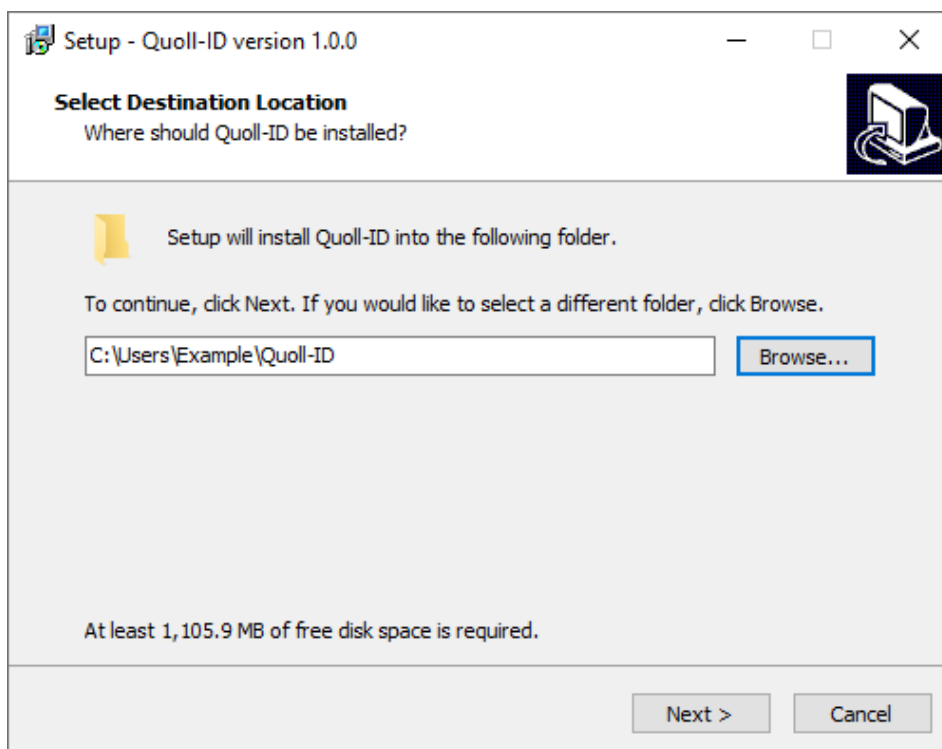Opening the installer file will start the installation process.

Figure 1: Quoll-ID installation process – Install directory.

The first screen of the installer requires the selection of an installation directory. The default location is the "Users" directory, but this can be changed to a location of your choosing.

Note: If you require Quoll-ID to be installed in a location that requires administrator privileges (e.g. "Program Files") you may need to run the installer as an administrator. To do this, right click on the installer file and select the "Run as administrator" option.
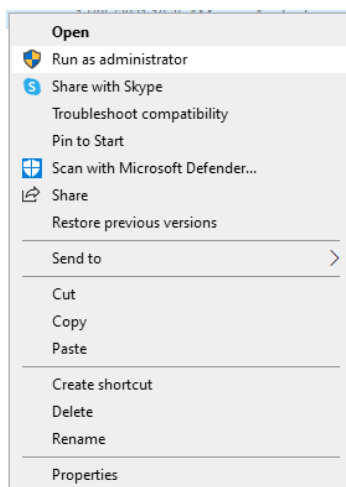

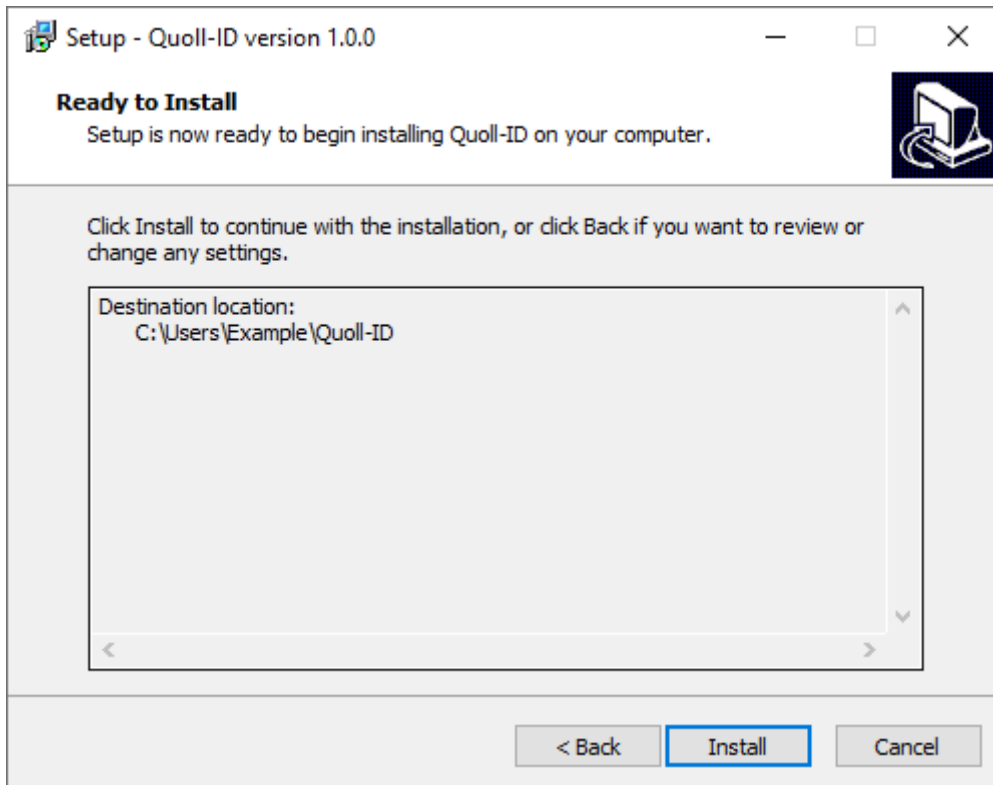*Figure 2: Running the installer as administrator.*

Figure 3: Quoll-ID installation process – Install Quoll-ID files.

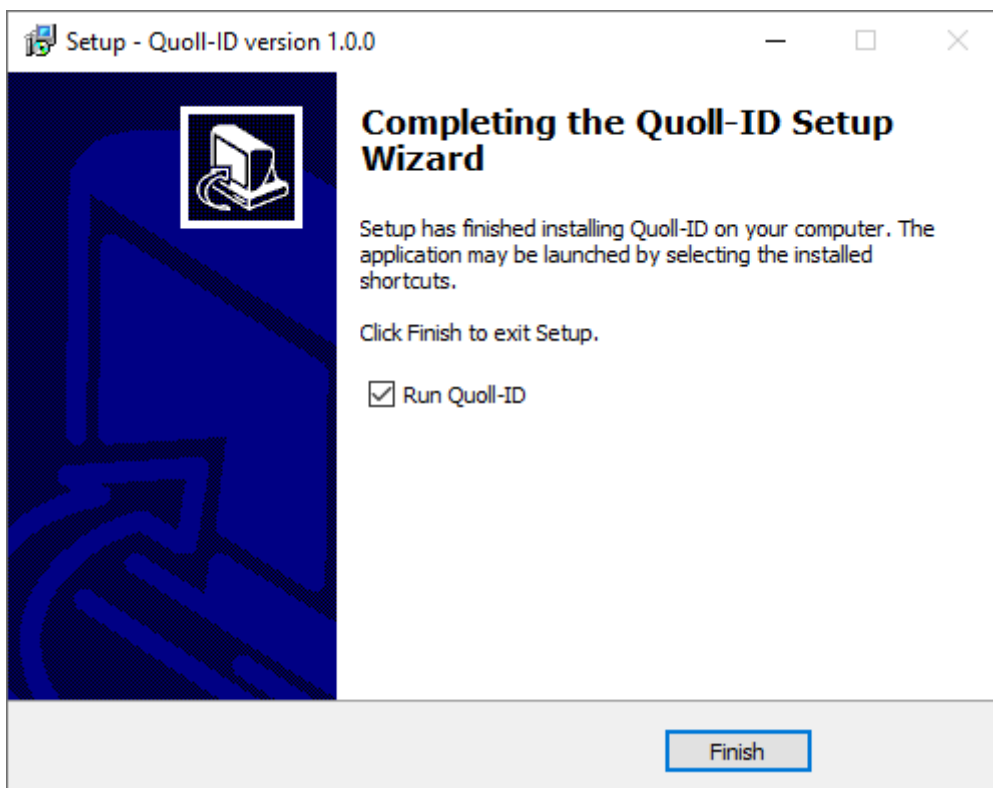Clicking the Install button will install Quoll-ID at the chosen location.

Figure 4: Quoll-ID installation process – Installation complete.

Clicking the Finish button will launch Quoll-ID.

2. Upgrade Quoll-ID

The Quoll-ID installer includes an upgrade component for upgrading Quoll-ID.

When running a Quoll-ID installer on a system that already has a previous version of Quoll-ID installed, you will be presented with the following prompt:
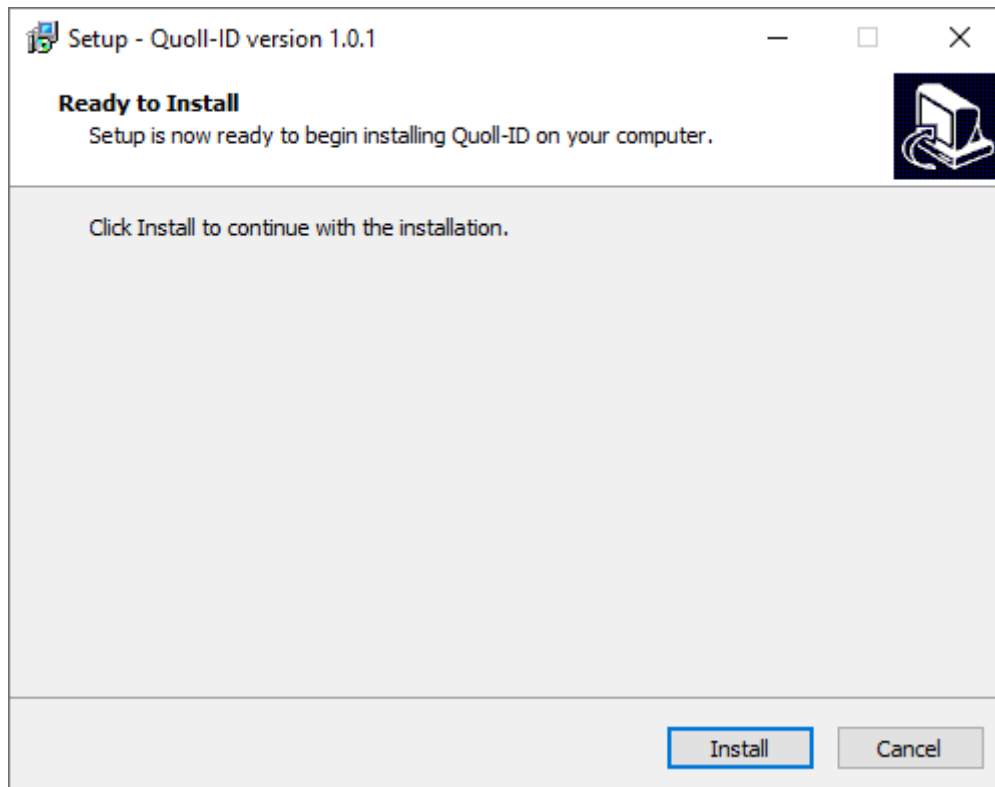

Figure 5: Upgrade Quoll-ID prompt.

Clicking the Install button will upgrade your current Quoll-ID installation.

When the installer has finished upgrading Quoll-ID, you will be presented with a prompt where you can either run Quoll-ID or close the installer.
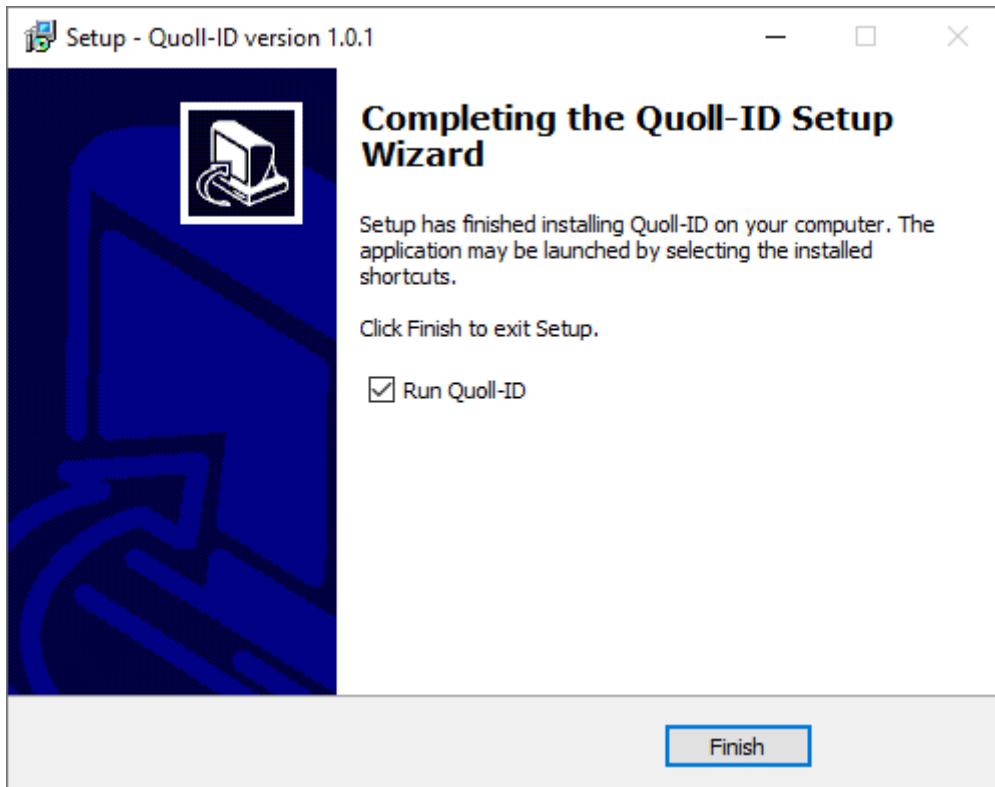
Figure 6: Quoll-ID installation process – Upgrade complete.

3. Uninstall Quoll-ID

To uninstall Quoll-ID, open the Control Panel via the Start Menu or searching for the Control Panel via the Search Box in the Windows Taskbar.

Figure 7: Windows Control Panel.

Select the "Uninstall a program" option in the bottom left of the Windows Control Panel window, and then select Quoll-ID from the program list. You will be presented with the following popup box:
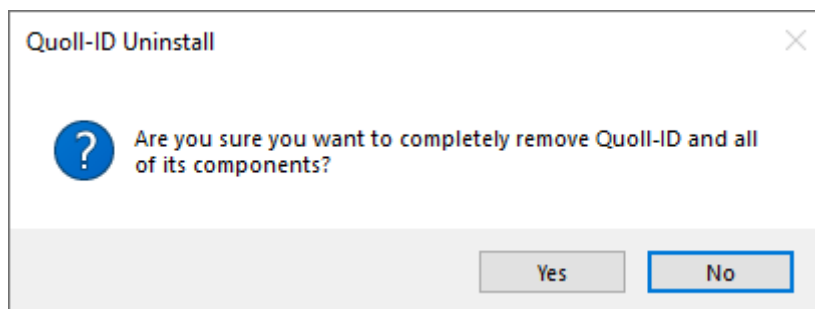
Figure 8: Quoll-ID Uninstall popup box.

Clicking Yes will start the uninstall process.
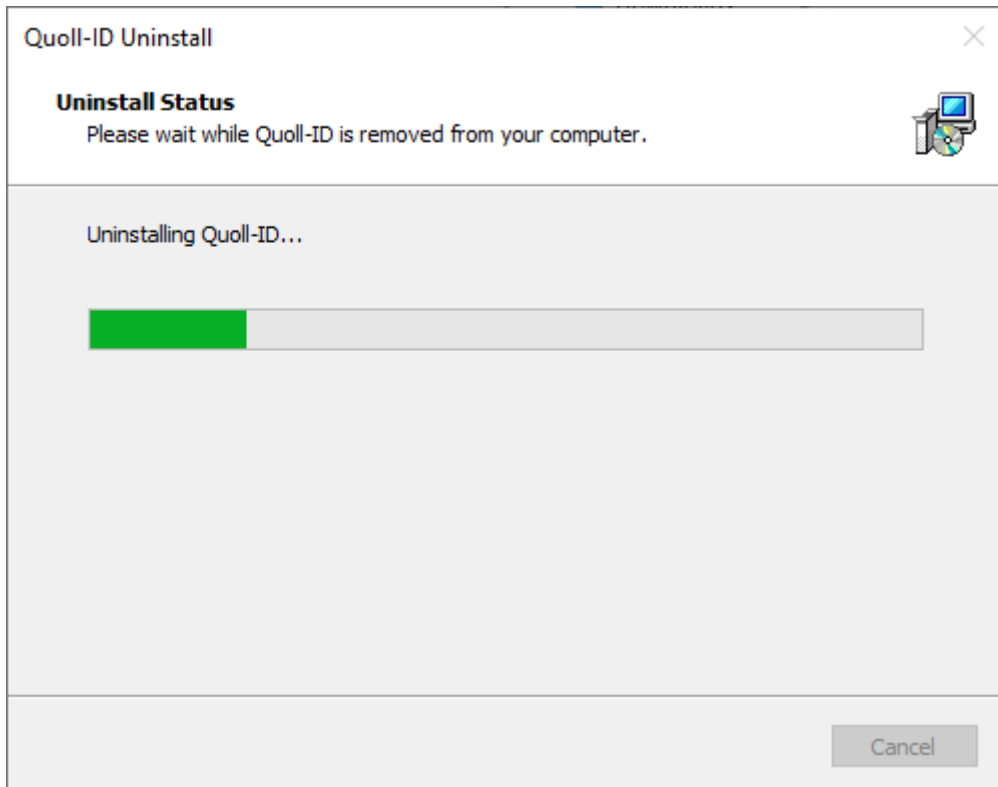
Figure 9: Quoll-ID uninstall process.

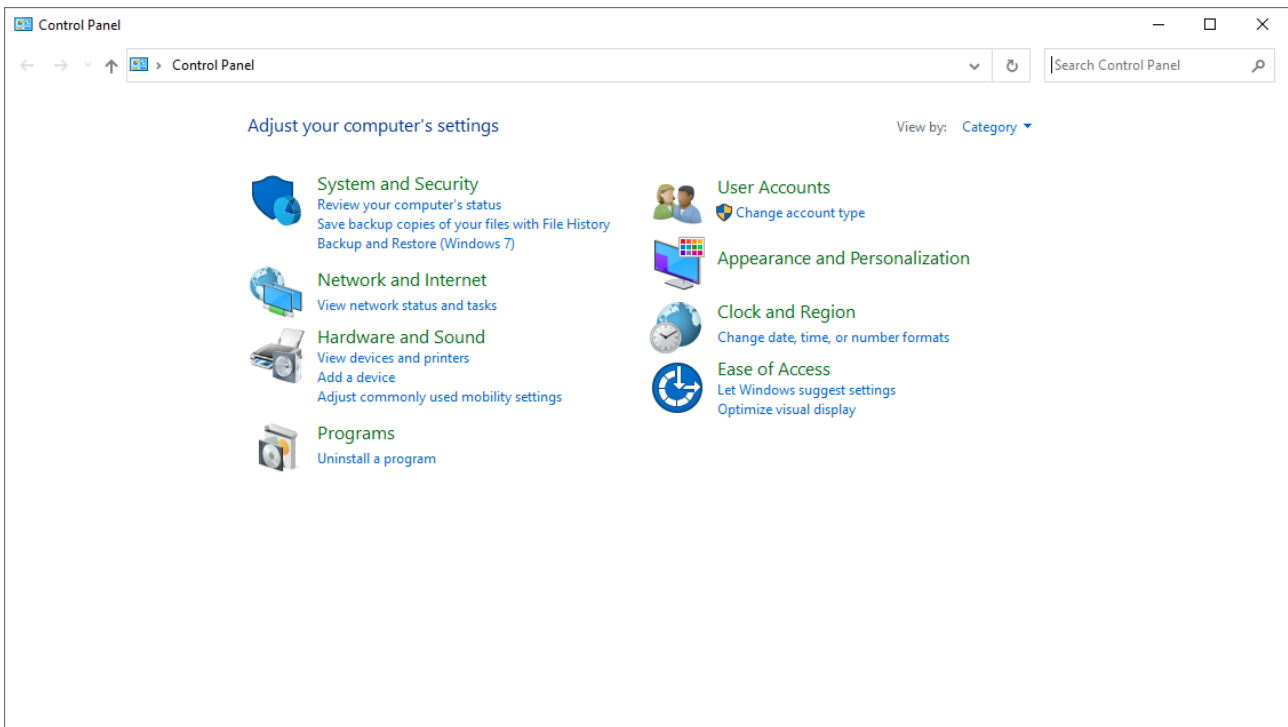When the uninstall process is complete you will be presented with a popup box notifying that Quoll-ID has been uninstalled.
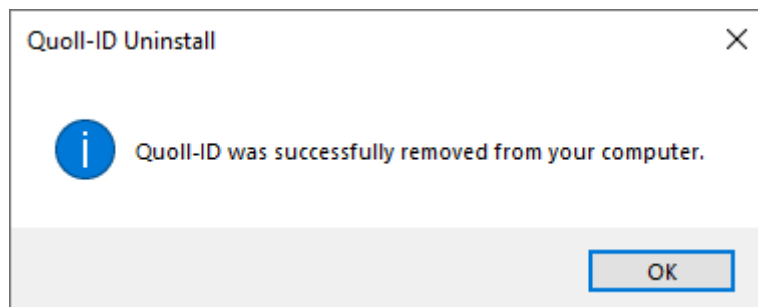
Figure 10: Quoll-ID successfully removed.

Note: The databases, database backups, and export data will not be uninstalled and will need to be manually removed from the location Quoll-ID was previously installed to if you would like to remove these data.

4.1. Main Window

The Main Window of Quoll-ID is where quoll images and identification results are displayed.

Figure 11: Main Quoll-ID window.

Figure 12: Main Quoll-ID window with interface labelled.

1. Identify Button – The Identify button starts the quoll identification process. When the Identify button is clicked the quoll identification method used will depend on options chosen in the Configure dialogue. If the batch identification method has been selected, all quolls in the batch 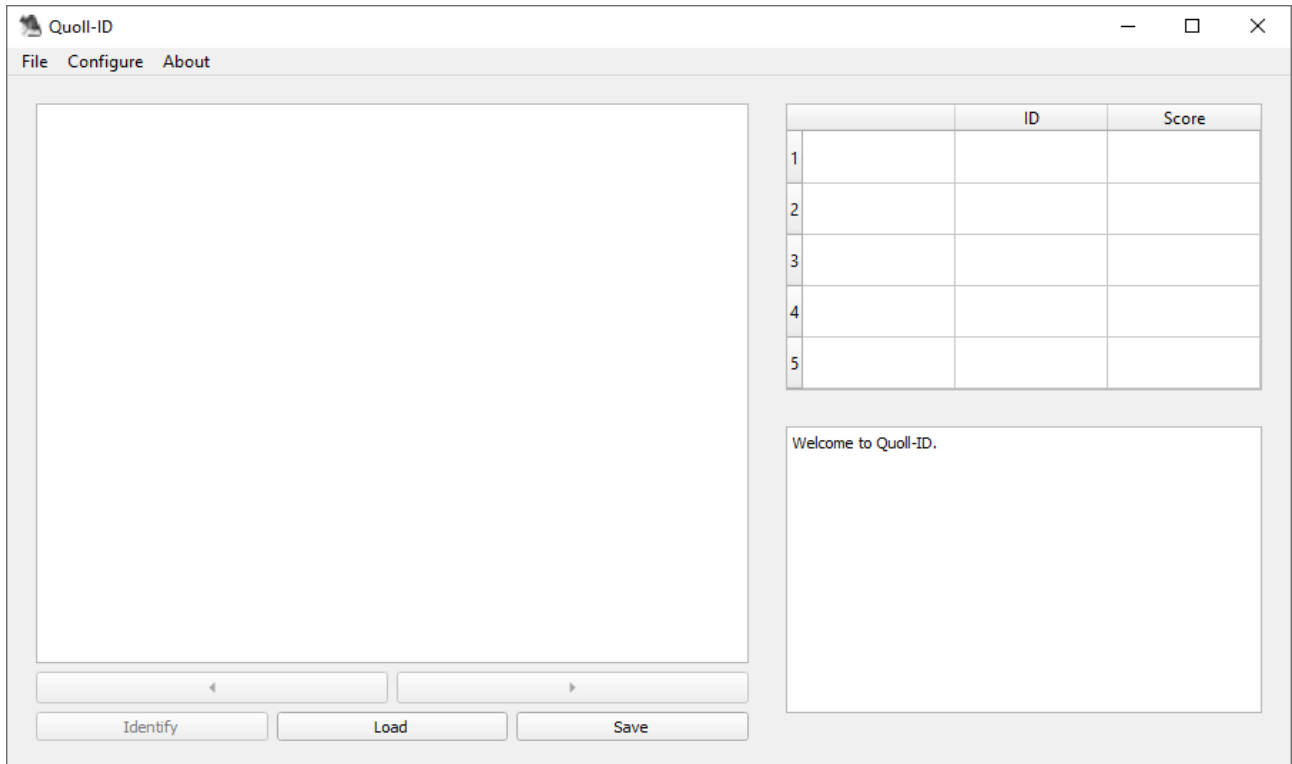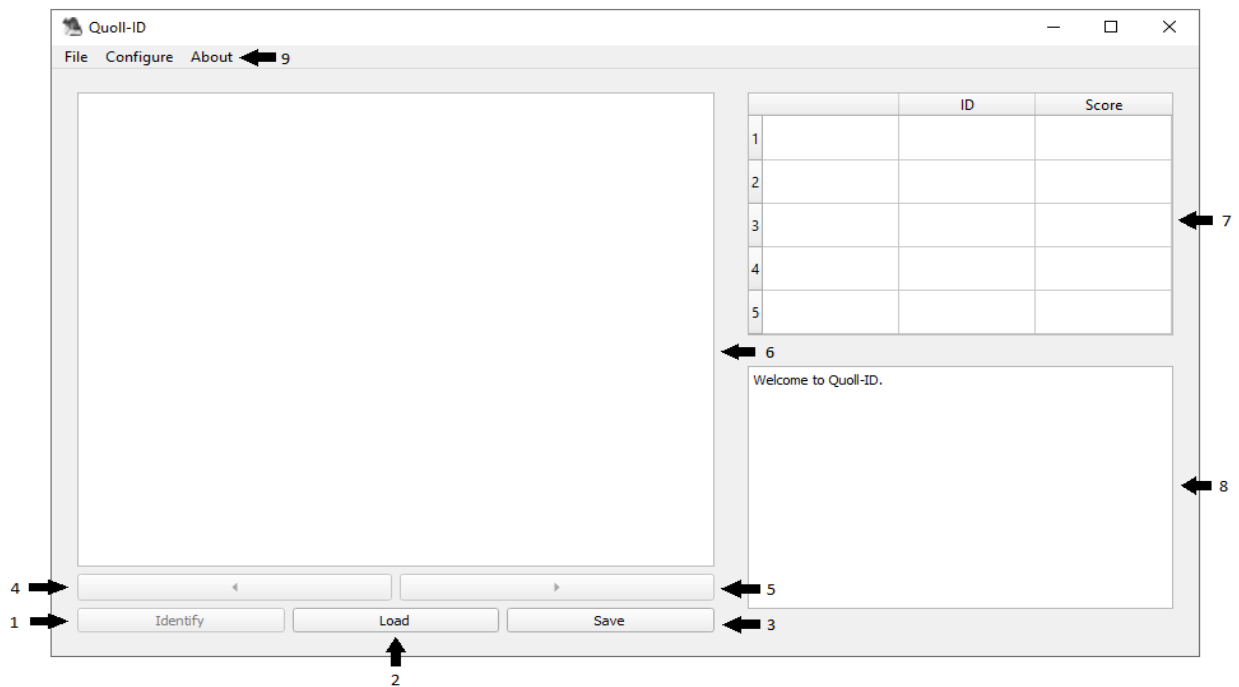will be processed. If single image identification has been selected, only the image visible in the Image View will be processed.

2. Load Button – The Load button is used to select images to process. When clicked, a dialogue will open to select the images to be processed.
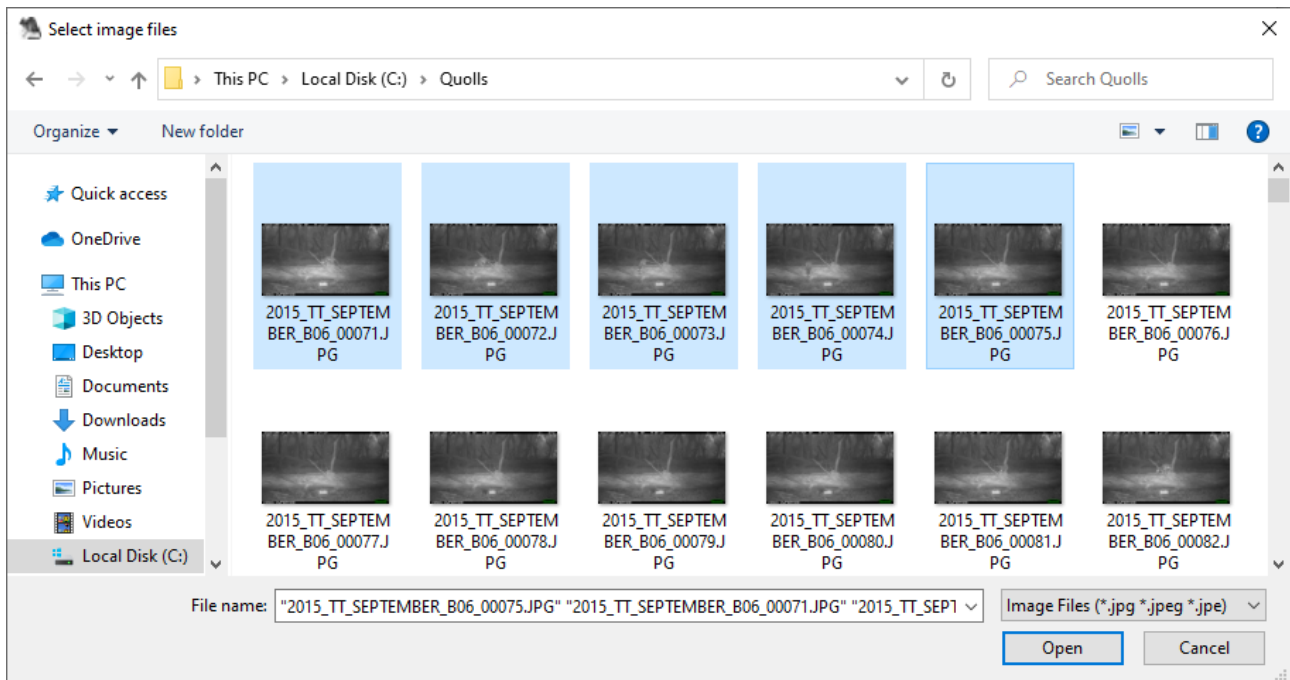
Figure 13: Load button dialogue.

3. Save Button – The Save button is used to save the results generated. When clicked, the results will be saved in the format selected in the Configure dialogue. The results are saved to the Export sub-directory which can be accessed via the Start Menu or Desktop links, or via the installation directory where Quoll-ID has been installed.

There are 4 possible export result combinations depending on what checkbox combination options are chosen in the Configure dialogue for the Group Export Results and Batch Ensemble Identifier checkboxes:

> 1: Group Export Results and Batch Ensemble Identifier – The export file will contain the results of the batch identification along with the results for each individual image identification.

> 2: Batch Ensemble Identifier – The export file will contain the results of the batch identification only.

> 3: Group Export Results – All single image results in the batch are grouped into one export file.

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4: Single Image Identifier – When neither the Group Export Results and Batch Ensemble Identifier checkboxes are checked, the results saved will be from the Results Table for the image currently on display in the Image View.

4. Left Button – The Left button is used to scroll left through the image batch.

5. Right Button – The Right button is used to scroll right through the image batch.

Note: Unless Batch Identification has been chosen, the results in the Results Table will be individualised per image and will change when the Left and Right button are clicked.

6. Image View – The Image view is used to view the images that have been selected to be processed.

7. Results Table – The results table displays up to the top 5 identification results. For batch identifications, the results table will show results for all images combined. For individual identifications, the results displayed will be for the individual image only.

8. Process Output – The process output provides updates on the identification process, any identified issues, and when the identification process has completed.

9. Menubar – The Menubar provides access to more dialogues and functions of Quoll-ID.
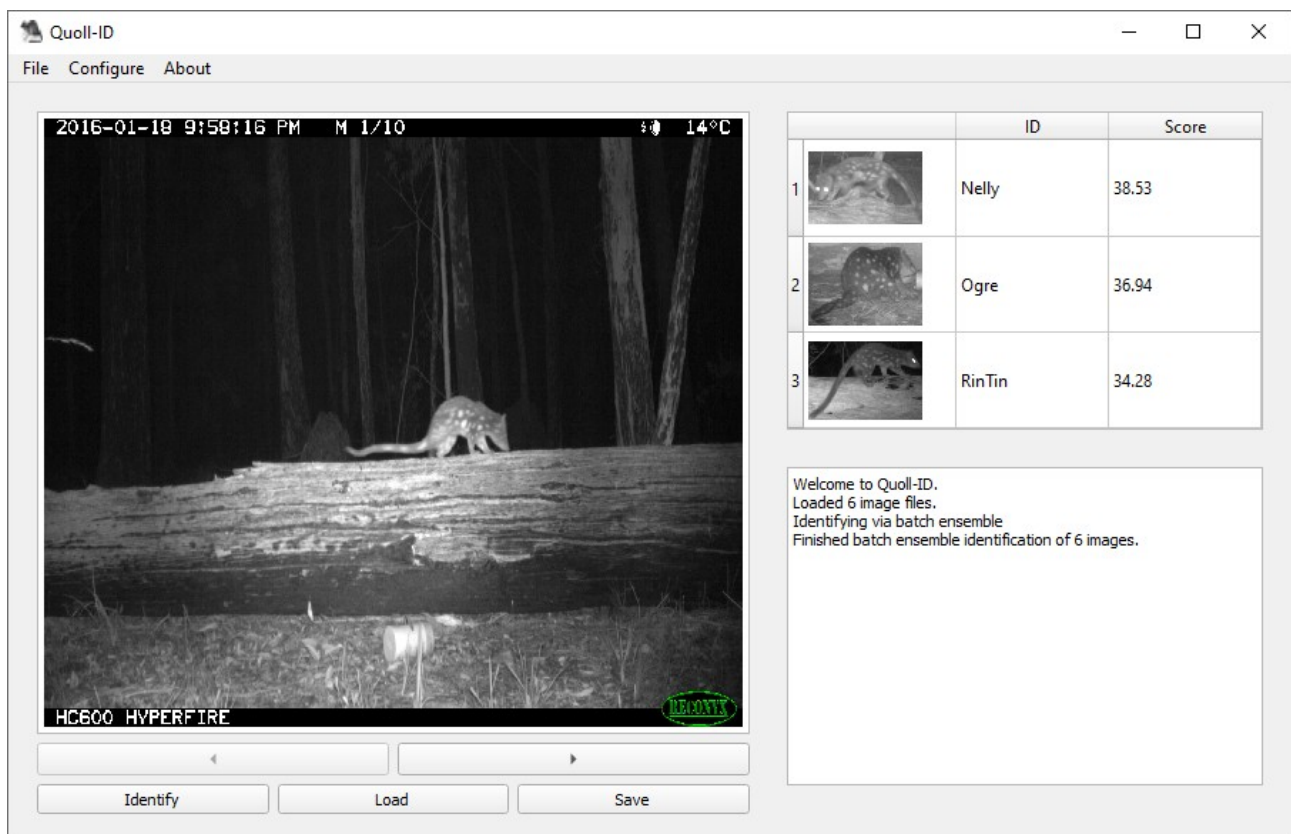
Figure 14: Screenshot of the Quoll-ID main window displaying identification results.

4.1.1. Menubar
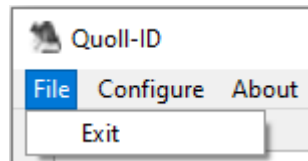
*Figure 15: Menubar
File menu.*

The File menu contains the Exit button, which is used to close Quoll-ID.
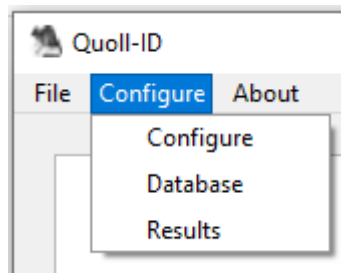
*Figure 16: Menubar
Configure menu.*

The Configure menu contains the Configure, Database, and Results dialogue buttons. Clicking one of these buttons launches the chosen dialogue.
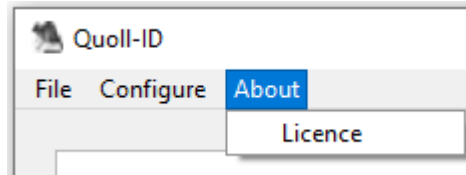
Figure 17: Menubar About menu.

The About menu button contains the Licence button. Clicking on the Licence button will launch the Licence dialogue.

4.2. Configure Dialogue

Figure 18: Configure dialogue.

Output: The format the results are saved in. The formats available are Comma Separated Values (CSV) and JavaScript Object Notation (JSON).

Identify Speed: The identify speed option selects the object detector to use for detecting quoll objects based on the speed of the chosen object detector. There are currently two options available: Fast – which uses YOLOv4, and Medium – which uses RetinaNet.

Identify Method: There are two identify methods available. Division – the pattern matching results for the quoll identified are divided by the number of images in the batch, if the results ar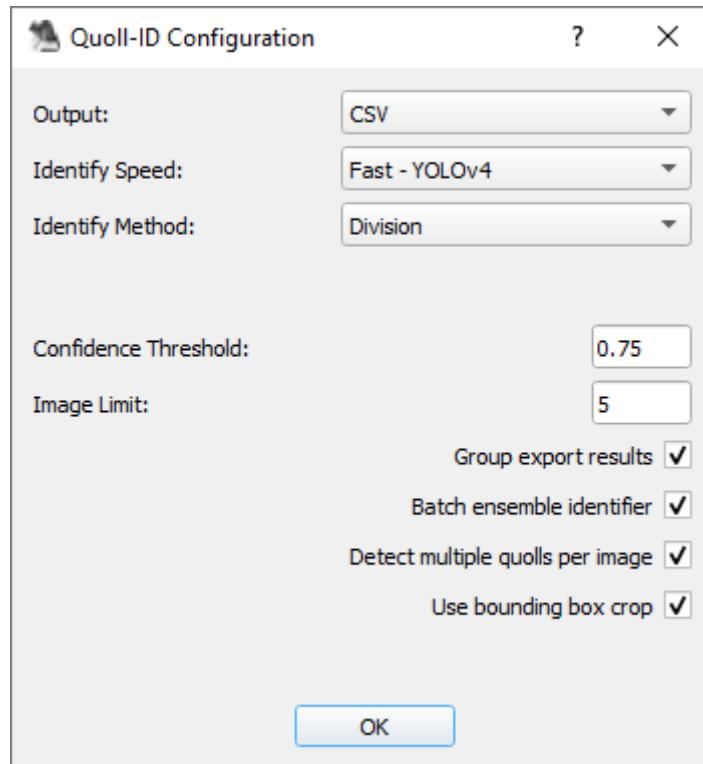e greater than zero. Addition – the pattern matching results for the quoll identified are tallied from all images in the batch.

Generally, division will produce the best results for most image batches. However, smaller batches may benefit from the addition method while larger batches may benefit from the division method.

Identifying single images does not use either method, and contains the number of pattern matches per quoll for that image.

Confidence Threshold: The confidence threshold level used throughout the identification process. The confidence level can be between 0.1 – 1. The lower the threshold, the more likely a quoll will be detected, while the higher the threshold the more accurate the detection will be. A threshold that is too low will possibly cause Quoll-ID to include background objects in identifications, which can lower the accuracy of results. A threshold that is too high can cause quolls to be missed during detection. The default threshold is 0.75.

Image Limit: The maximum number of images to include in a batch.

Group Export Results: Results exported can either be for all images in the batch in the one export file, or individual results per image. Checking the Group Export checkbox will group the results.

Batch Ensemble Identifier: Quolls in an image batch can be identified by batch where all the results in the batch are collated, or quoll identifications can be per individual image.

Detect Multiple Quoll Images: When checked, this option enables multiple quolls to be identified per image. This works by tracking quoll objects across a batch of images and grouping detected objects that are identified as the same quoll. Quoll-ID then determines an overall identification and score per tracked quoll group.

Use Bounding Box Crop: Checkbox to enable using the bounding box crop, created by the object detector chosen for identify speed, for pattern matching instead of using the Mask R-CNN crop.

4.3. Database Dialogue

Quoll-ID quoll identifications are made by comparing quoll markings in images loaded into Quoll-ID against quoll markings stored in a database. Quoll-ID supports multiple quoll databases, and each database can contain multiple quolls. Databases can be created and modified within Quoll-ID via the Database Dialogue. When a database is modified, a backup of the unmodified database is copied to the "backup" directory located in the Quoll-ID install location.
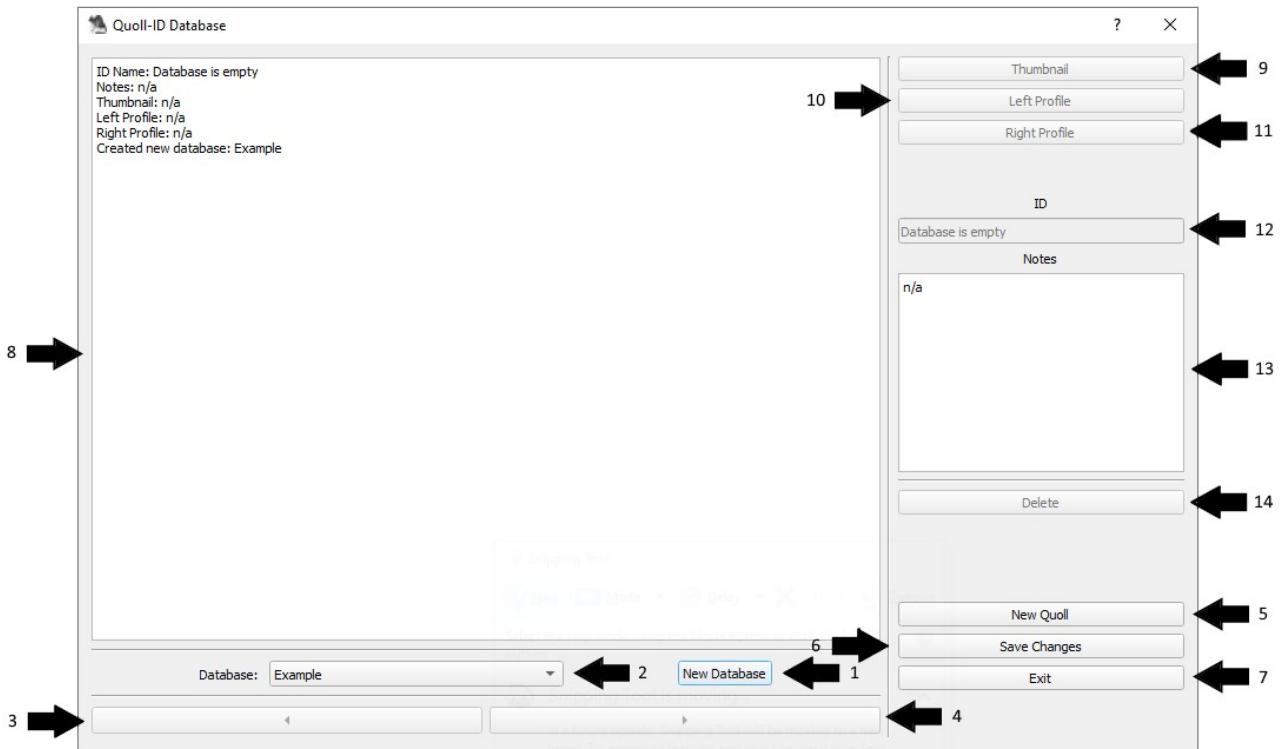
Figure 19: Database dialogue with interface labels.

1. New Database Button – Creates a new blank database.

2. Database Combo Box – Select a quoll database to use for quoll identifications.

3. Left Button – Used to move left through quoll database entries.

4. Right Button – Used to move right through quoll database entries.

5. New Quoll Button – Creates a new quoll entry in the currently selected database.

6. Save Changes Button – Saves changes to the currently selected database.

7. Exit Button – Exits the Database dialogue.

8. Content Output – Contents of the currently selected database entry are outputted here.

9. Thumbnail Button – Select a new thumbnail for the current quoll entry. Thumbnails are displayed in the main window identification results table.

10. Left Profile Button – Select a new left profile image to use for the currently selected quoll entry.

11. Right Profile Button – Select a new right profile image to use for the currently selected quoll entry.

12. Quoll ID – The ID/Name to use for a new quoll entry, or to display the ID/Name of the currently selected quoll entry.

13. Notes – Notes written about the currently selected quoll entry.

14. Delete Button – Deletes the currently selected quoll entry from the database.
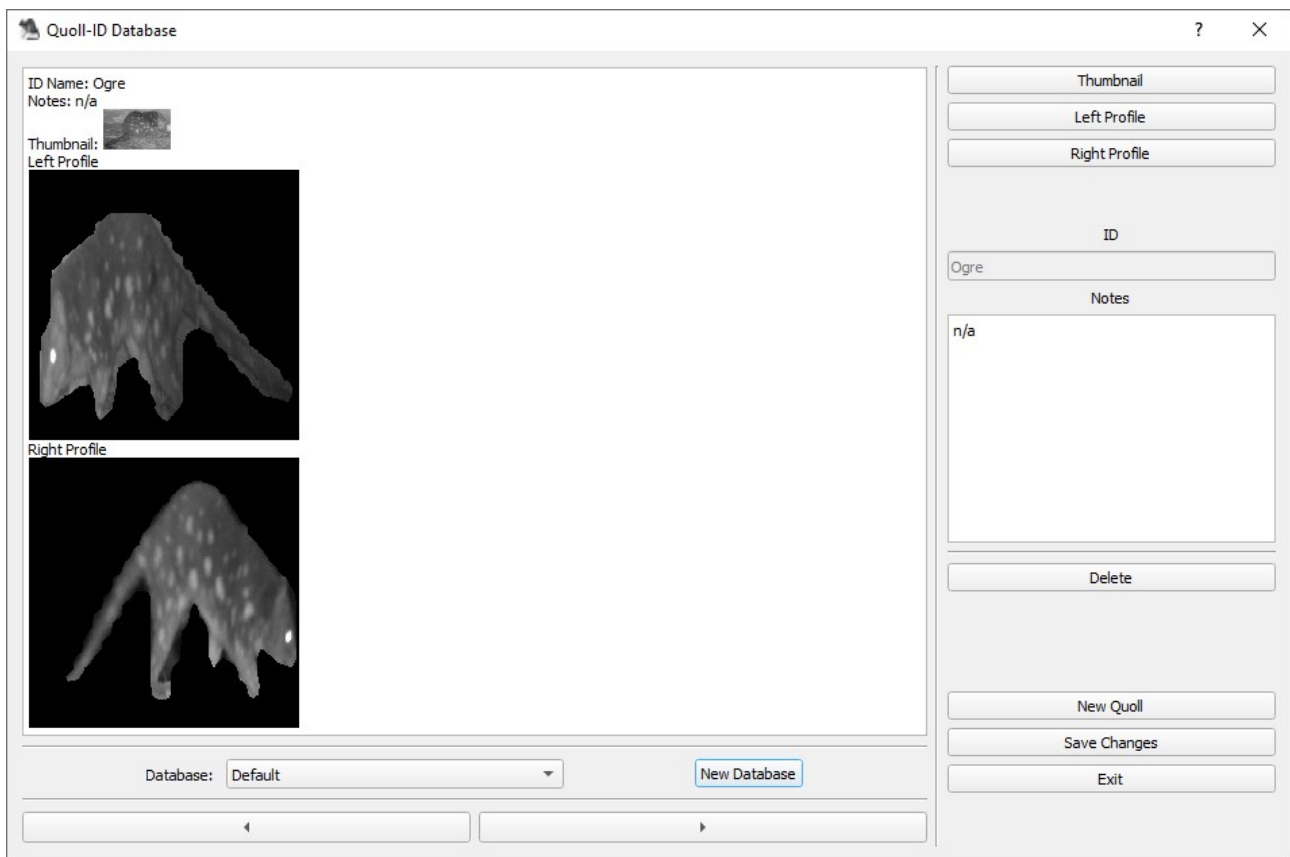
Figure 20: An example of a database entry in the database dialogue.

4.4. Results Dialogue
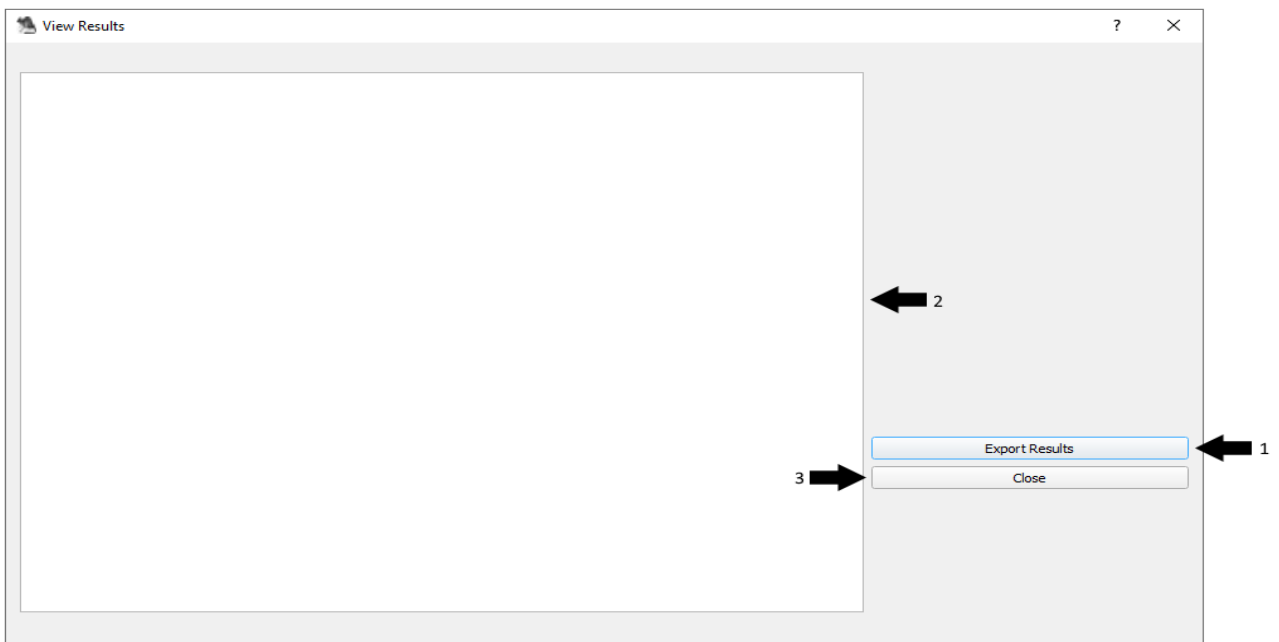
Figure 21: Results dialogue with interface labelled.

1. Export Results Button – Choose a location to save the displayed output in the results dialogue.

2. Output – Quoll identification results output.

3. Close Button – Closes the results dialogue.

Figure 22: An example of results displayed in the results dialogue.

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4.5. About Dialogue

Figure 23: The About dialogue which displays the Quoll-ID licence.

The About dialogue is used to display the Quoll-ID version number and licence.

4.6. Settings

Quoll-ID configuration settings are automatically saved in a settings file to allow for configuration options and other user-defined configurations in Quoll-ID to remain persistent between usages. The following settings are saved:

Configure Dialogue Settings: All setting configurations chosen in the Configure dialogue will be saved.
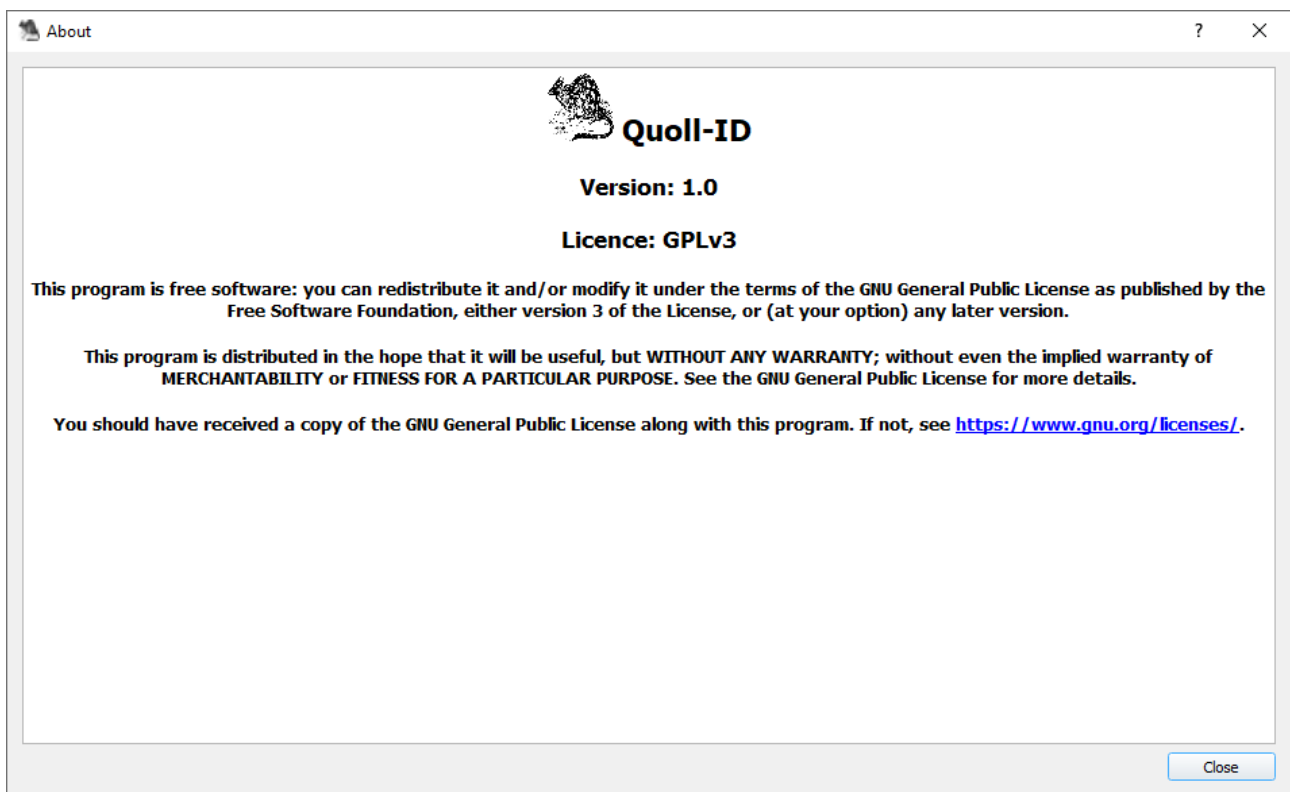
Frame Height and Width: After re-sizing the Main Window height and width, the chosen size is saved. When Quoll-ID is re-opened it will be have the same Main Window dimensions from the previous time Quoll-ID was used.

Last Opened Directory: The last opened directory to select images to identify quolls will be saved and will be the default location for identifying quolls the next time Quoll-ID is opened.

Chosen Database: The last used database is saved and will be the default selected database the next time Quoll-ID is opened.

5.1. Quickstart Guide – Creating a new Database

To quickly create a new database, follow the following steps.

Populate the existing "Default" database or create a new database

- Open the Database Dialogue.

- The default database named "Default" can be used.

- Alternatively, click the "New Database" button and create a new database with a name chosen by you.

Create new quoll entry

- Click the "New Quoll" button.

- Choose a name for the quoll for the quoll ID.

- Click the "Thumbnail" button and select an image to be used for the quoll's thumbnail.

- Click the "Left Profile" button and select the left profile image to use for the quoll.

- Click the "Right Profile" button and select the right profile image to use for the quoll.

- (Optional) Write notes about the quoll in the Notes box.

- Click the "Save Changes" button to save the quoll into the database.

- Repeat the above steps until all quolls are added to the database.

- The database is now ready to use for identifying quolls.

5.2. Quickstart Guide – Using Quoll-ID

To quickly start using Quoll-ID, follow the following steps.

Select a database

- Open the Database Dialogue and select the database you wish to use.

- If there are no database entries to select create a new database.

- Ensure there is at least one quoll entry in the database you use, containing both right and left profiles.

Choose configuration

- Open the Configure Dialogue and select the configuration you would like to use.

- Choose the identify method (Addition or Division).
  Note: Addition works best with small batch sizes while division works best with large batch sizes. Single image identifications do not use either method.

- Choose the confidence level threshold for image crops (default is 0.75).

- Set a batch limit. This is used for limiting the number of quolls that can be included in a batch.

- Check the "Group export results" checkbox if you would like to export the results of all images in a batch to the one export file.

- Check the "Batch ensemble identifier" checkbox to identify quolls in a batch. Uncheck if you would prefer to identify only the currently viewed single image in the batch.

- Check the "Detect multiple quolls per image" checkbox if you would like Quoll-ID to detect multiple quolls per image, group object detections by identified quoll, and determine quoll classifications and scores by identified quoll results rather than by collated batch results.

- Check the "Use bounding box crop" checkbox if you would prefer to use the bounding box image crop instead of the Mask R-CNN image crop for pattern matching. This can be useful in situations where the Mask R-CNN image crops are providing suboptimal results.

Choose images

- Click the Load button and select the batch of images you would like to use.

Identify quolls

- Click the Identify button to start identifying quolls.

- Updates will be provided in the Main Window Output box while quolls are being identified.

- When complete, the results output will be displayed in the Main Window Results Table.

5.3. Quickstart Guide – Exporting results

Both the identification results and annotated images produced by Quoll-ID can be exported.

Exporting identification results

- Before or after quolls have been identified, open the Configure dialogue.

- Choose the result output file type (CSV or JSON).

- Check the "Group export results" checkbox if you would like to include individual identification results per image in the export file.

- Click the Save button to complete the export. The results will be saved to the export sub-directory located in the Quoll-ID directory. A link to the export results location is added to both the Desktop and the Start Menu during the Quoll-ID installation.

Exporting annotated image results

- Open the Results dialogue.

- Click the Export Results button. A dialogue will open where you can select a folder to save the annotated images.

- Once the folder has been selected, all images currently visible in the Results dialogue will be saved to the chosen location.