



(Lion Identification Network of Collaborators)

## USER MANUAL

2024

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## **WHAT IS LINC?**

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- The Lion Identification Network of Collaborators ([LINC](#)) is a platform for the collection of lion data and the automated identification of lion individuals.
- LINC promotes collaboration between lion researchers, helping them accurately monitor lion populations and the connectivity between them.
- This greater broad scale understanding of lion populations allows for more effective conservation across African lion rangelands.

### **Key features of LINC**

- LINC's online interface allows users to submit, search, and cross reference lion data collected and entered into the system by researchers across the continent.
- It also uses the latest computer vision technologies to run automated comparisons of a user's new lion photos against all lions already in the database to check for potential matches.

### **How the LINC database is structured**

Each research organization has its own platform on LINC onto which they load their lion database. Each organization's database will consist of lion individuals that they have recorded within their study area. Each lion will have its own profile detailing its "personal information" such as its name, age, sex and photographs. Each time the same lion is seen in the field again after the creation of its primary profile, the information about this new observation can also be added to LINC and "linked" to the same lion's primary profile to create an on-going record of this individual.

### **Users and organizations**

- Each LINC user is linked to one conservation organization.
- There can be many users per organization, and each user can add to and edit their own organization's lion data without restrictions.
- You may be able to view other organizations' data, depending on their [permission settings](#), but you cannot edit data belonging to others.
- Admin users can log in to and create/delete/edit user accounts, however, they do not have an organization or any lions associated with them.

### **LINC privacy settings and permissions**

Data on LINC can be set to private or public, depending on your preference. Public data can be viewed by any user with access to LINC. Private data can only be viewed and edited by users within the same organization. For example, if a member of Lion Guardians uploads photos of a lion and sets them as private, only other users who are part of the Lion Guardians' organization will be able to view and edit these data; other organizations will not be able to see them. Each

photo and GPS points can also be set as private, to respect the privacy and copyright that conservationists hold on their data.

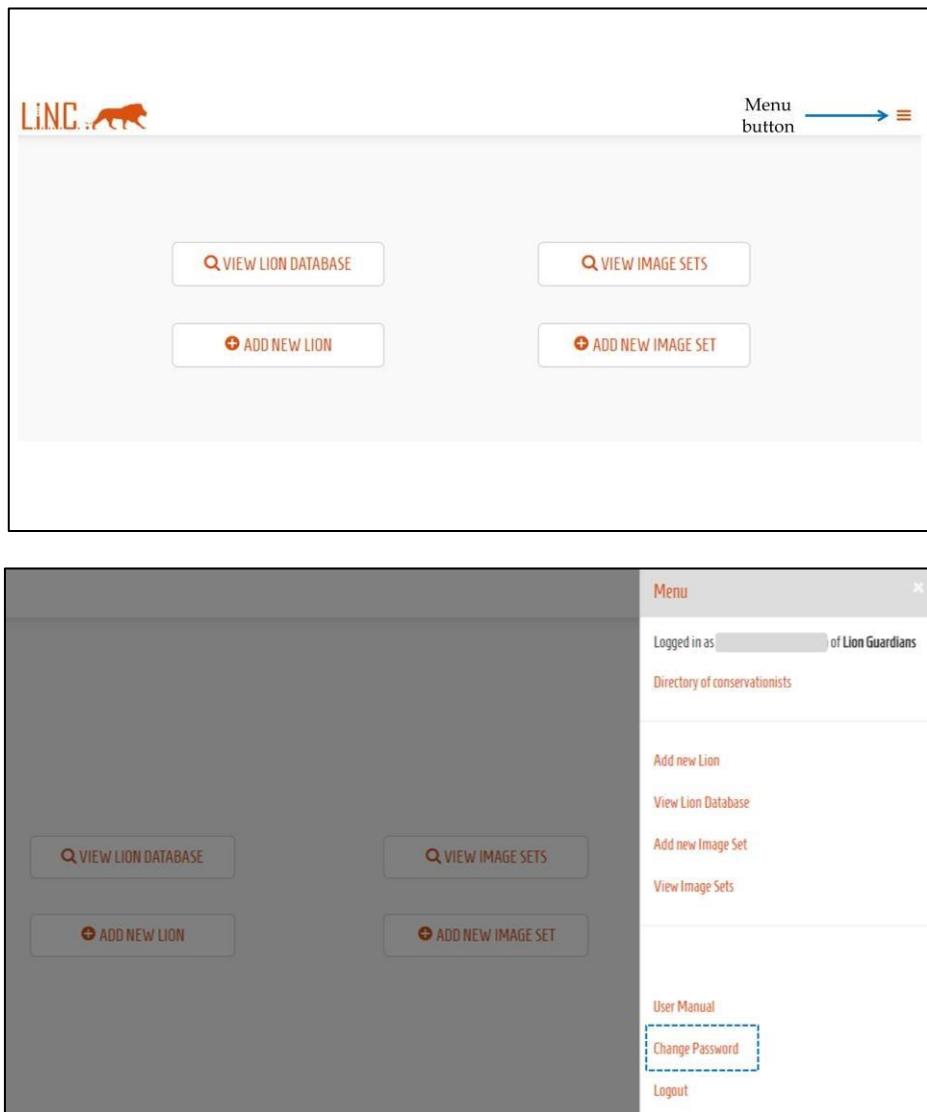
Ownership of data can be transferred between organizations if desired; however, once the data are transferred, the previous owning organization only has ‘public’ access to the lion and so they can no longer edit, add or delete anything.

## GETTING STARTED ON LINC

To log in to LINC, go to <https://linc.linclion.org> and enter the username & password provided to you by the admin team.

### Resetting your password

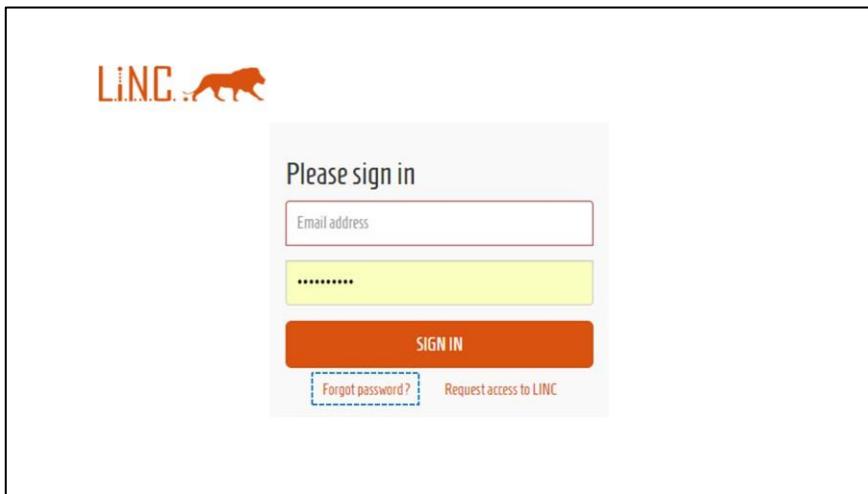
Once you have logged in, you may want to reset your password to one of your own choosing; Select the menu button on the homepage, then press **Change password**.



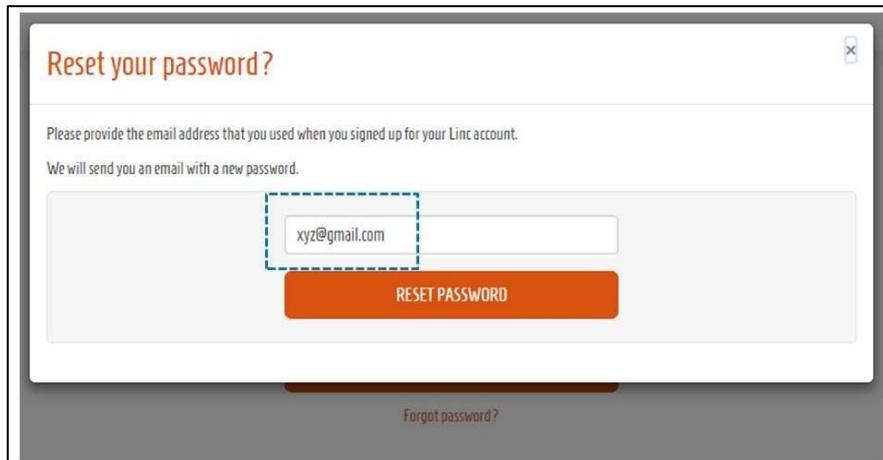
Enter and confirm this new password, then click **Change password** when done. This is now your new password to log into LINC.

### **Forgotten password**

If you have forgotten your password or lost the one given to you, you can reset it from the log in page by clicking **Forgot password**.

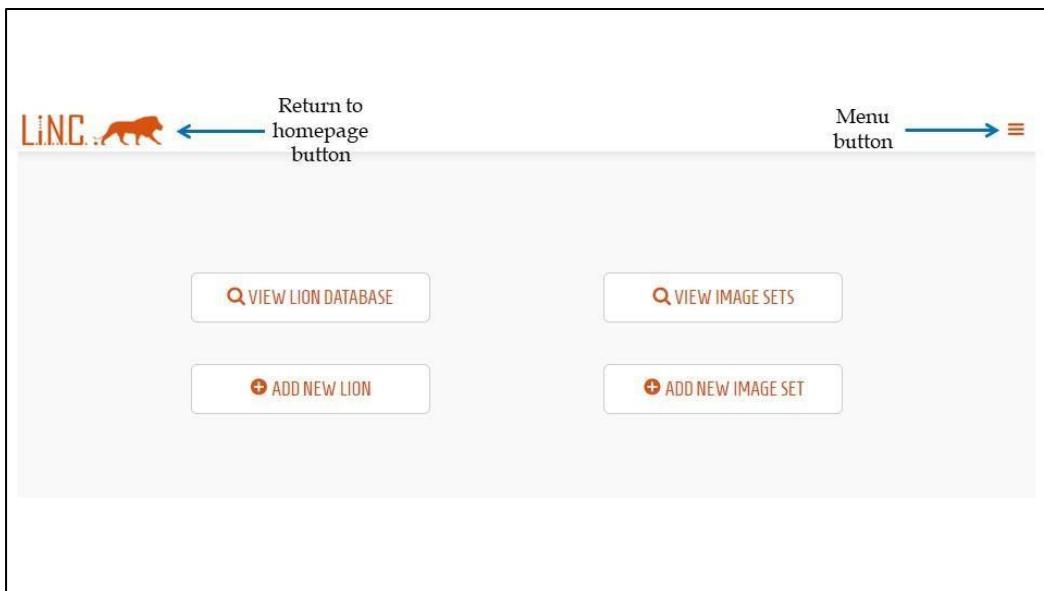


Enter the email address to which you want the new password to be sent to, then click the **Reset password** button.



This will send your new password to the given email addresses, and you can then log in with this password. Remember to then change this auto-generated password to one of your choosing by following the steps above.

## Navigating the homepage



The LINC logo button is always visible in the top left corner of all pages and when pressed, it will return you to the homepage. Through the menu button at the top right corner of the page, you can access the admin aspects of LINC (changing passwords, looking up email addresses of other LINC users, accessing the user manual and logging out of LINC).

These two buttons on the homepage allow you to search through the data in the LINC database:



- **VIEW LION DATABASE** opens a list of all the lion individuals recorded in the database.
- **VIEW IMAGE SETS** opens a list of all the data on additional observations of each of these lions, known as *image sets*.

These two buttons allow you to upload your organization's data on lions in your study area.



LINC stores these data online and you can access and update them at any time:

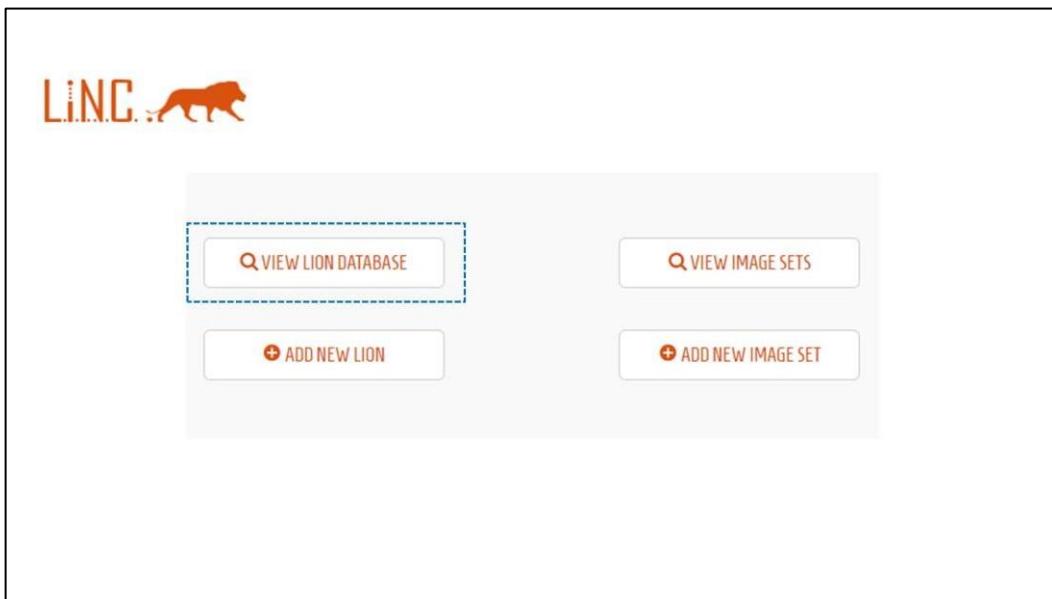
- **ADD NEW LION** creates a primary profile for an individual lion that is new to LINC. The primary profile contains all the important information about this lion and how to identify it.
- If a lion already exists on LINC, but is observed again after its primary profile has been

created, you can click **ADD NEW IMAGE SET**. The data for this specific observation is then added as a separate collection (known as an image set) which can then be linked to the lion's primary profile. This helps keep track of the lion over time (recording any new features, movement, etc.).

## LOOKING THROUGH LINC'S LION DATABASE

### Finding and viewing a lion's primary profile

Each lion in the database has a primary profile, which details all its "personal information". To open up a list of **all** the lion individuals in LINC's database, go to the LINC homepage, and select **VIEW LION DATABASE**.



In the resulting list, each row represents one individual and includes some details about that individual under the various columns (you can select which of these columns you want to see by clicking the **COLUMNS TO SHOW** drop-down).

A screenshot of the 'View Lion Database' page. At the top center, it says 'Select which data columns are shown by clicking the relevant titles'. A blue arrow points from this text to a dropdown menu titled 'COLUMNS TO SHOW'. The dropdown menu has two buttons: 'SELECT ALL' and 'SELECT NONE'. It lists several columns with checkboxes: Age (checked), Date of Birth, Dead (checked), Organization (checked), Gender (checked), Latitude, Longitude, Location Tag (checked), GPS Points Private, Tag Features, Notes, Time Stamp (checked), and Verified. Below the dropdown is a table showing 268 lions found, with columns for Id, Photo, Name, Imageset Id, Age, Dead, Organization, Gender, Location, and a timestamp. On the left, there is a 'Refine by' sidebar with checkboxes for Name or ID, Organization, Age, Gender, Features, Location, and Geographical.

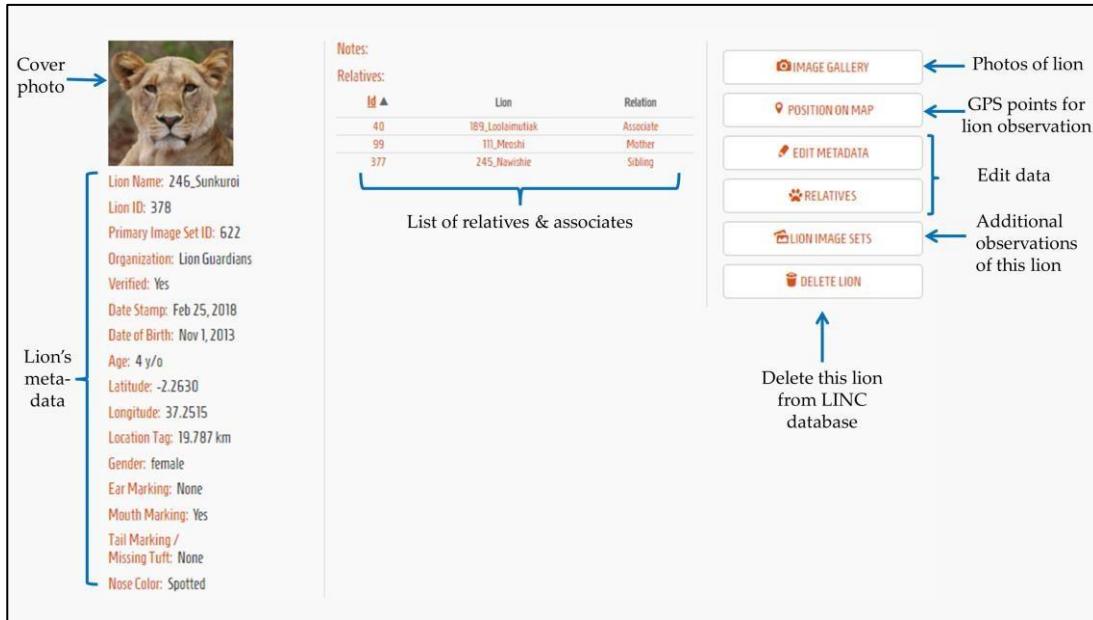
The columns show:

- **Age:** Approximate age of the lion.
- **Date of birth:** Date the lion was born.
- **Dead:** Living status of the lion (if dead, it will be marked with a black gravestone symbol).
- **Organization:** The name of the organization that created the lion and owns its data.
- **Gender:** Male, female or unknown sex.
- **Latitude/Longitude:** GPS coordinates where the lion was observed (in Decimal Degrees).
- **Location Tag/Approximate location:** If there is no specific GPS point associated with a lion, the location tag indicates the approximate area where the lion was seen.
- **GPS point Private:** Indication of whether the GPS points for the lion observation are public or kept private (so only the owning organization can view them). Tick indicates they are private, X indicates they are public.
- **Tag Features:** Distinguishing features of the lion, such as its markings.
- **Notes:** Any additional notes the user has added about the lion.
- **Time Stamp:** The date on which the lion was last observed.
- **Verified:** A green tick indicates that the lion has been checked and is accurately identified, and X shows that it has not been verified yet.

To access a specific lion's primary profile, you can narrow down the list of individuals shown using the filter buttons on the left side of the page - under "Refine by" (see [pg. 42](#) for more details on how to search using filters).

268 lions found.										
Id	Photo	Name	Imageset Id	Age	Dead	Organization	Gender	Latitude	Longitude	Date Stamp
333		007_Charly	576	16 y/o		Lion Guardians	female	-2.381597	37.675707	Mar 27, 2007
310		012_BirdieNApe	474	16 y/o		Lion Guardians	female	-2.792841	37.807786	Mar 26, 2012
122		016_Manyweli	208	16 y/o		Lion Guardians	male	-2.604098	37.708661	Oct 15, 2016
311		019_Asama	475	15 y/o		Lion Guardians	female	-2.338088	37.383579	Jun 16, 2017
312		024_Singita	476	14 y/o		Lion Guardians	female			Oct 7, 2008
115		025_Amboga	200	14 y/o		Lion Guardians	male	-2.376232	37.269915	Sep 17, 2016
116		027_Loomkito	201	14 y/o		Lion Guardians	male	-2.376232	37.269910	Sep 26, 2016
123		037_Shore	209	13 y/o		Lion Guardians	male	-2.604098	37.708661	Oct 15, 2016
86		045_Nkaini	142	12 y/o		Lion Guardians	female	-2.835544	37.306504	Apr 13, 2016
71		046_Ghaka	177	12 y/o		Lion Guardians	male	-2.490460	37.040477	Mar 21, 2016

Clicking on an individual row of the lion database will open that lion's profile in more detail.



Each lion's primary profile includes:

- The lion's cover photo - your favourite picture of the lion, which everyone on LINC can see as a thumbnail.
- Metadata on this lion - such as its given name, the lion's approximate date of birth & age, its GPS coordinates when observed and the name/area of this location, its gender, and details of any markings on the ears, eyes, nose, mouth and/or tail.
- Notes - any extra information on the lion to help others identify this individual lion.
- Relatives - a list of this lion's known relatives and associates.
- Image gallery - A set of photographs of this lion to help identify the individual. These include photos of its face (portrait and profile), whiskers, body, ears, eyes, nose, mouth and tail.
- A display of GPS pins to show locations of this lion during times it was observed.
- A button for editing the metadata.
- A button for editing data on the listed relatives of this individual.
- A link to the lion's additional image sets- data on additional observations of this individual added to its profile after the creation of its primary profile. Image sets capture and store data on this lion over time, including the location for each new observation.
- A delete button to remove the lion from LINC's database.

You can look through more photos within a lion's profile by clicking the **IMAGE GALLERY** button. This will bring up a gallery of ALL the photographs in this lion's primary profile.

**Lion Info**

**Notes:**

**Relatives:**

ID	Lion	Relation
40	189_Loolaimutiak	Associate
99	111_Meoshi	Mother
377	245_Nawishie	Sibling

**IMAGE GALLERY**

**POSITION ON MAP**

**EDIT METADATA**

**RELATIVES**

**LION IMAGE SETS**

**DELETE LION**

The photo types are categorized as ‘CV image’, ‘Full body’, ‘Main ID’, ‘Markings’, ‘Whiskers Left side’, ‘Whiskers Right side’ or ‘Whiskers (do not use in algorithm)’ (see [pg. 20](#) for details on each type). If you want to view a subset of photos of this lion (e.g. only whisker photographs), you can choose a subset of image types under the filter **Image tags** (if you only wanted to see photos of whisker on the left of the lion’s face you’d select ‘Whisker Left’ under the **Image type**).

**Image Gallery (Imageset - 622)**

Hovering the cursor over an image will show the name & date on which the photo was taken

**Order by:** NAME ▲ ↴ Filter to sort photos by name, date or image type

**Image Tags:**

- CV Image
- Full Body
- MainId
- Marking
- Whisker Left
- Whisker Right
- Whisker (Do not use in Algorithm)

**Properties:**

- Public
- Private
- Joined Image
- Not Joined
- Cover Image
- Not Cover Image

**DOWNLOAD ORIGINAL** **UPLOAD IMAGES**

You can arrange the photos in the gallery using the dropdown button **Order by**:

- ‘Name’ arranges them according to the name that you, or the person who uploaded the photograph of the lion, saved the image as (hover over the image to view the image name).
- ‘Date’ arranges them in order of the date on which the photograph was taken.
- ‘Type’ arranges them according to their image type (*CV/full body/main ID/markings/whisker left, right, not for algorithm*).

You can click on any photo to enlarge it. You can also zoom into and out of the photo using the magnifying glass zoom button. To scroll back and forth through the enlarged photographs of this individual, select the arrow left/right button (the slide show will move in the order of the sort-filter chosen via the Order by button).

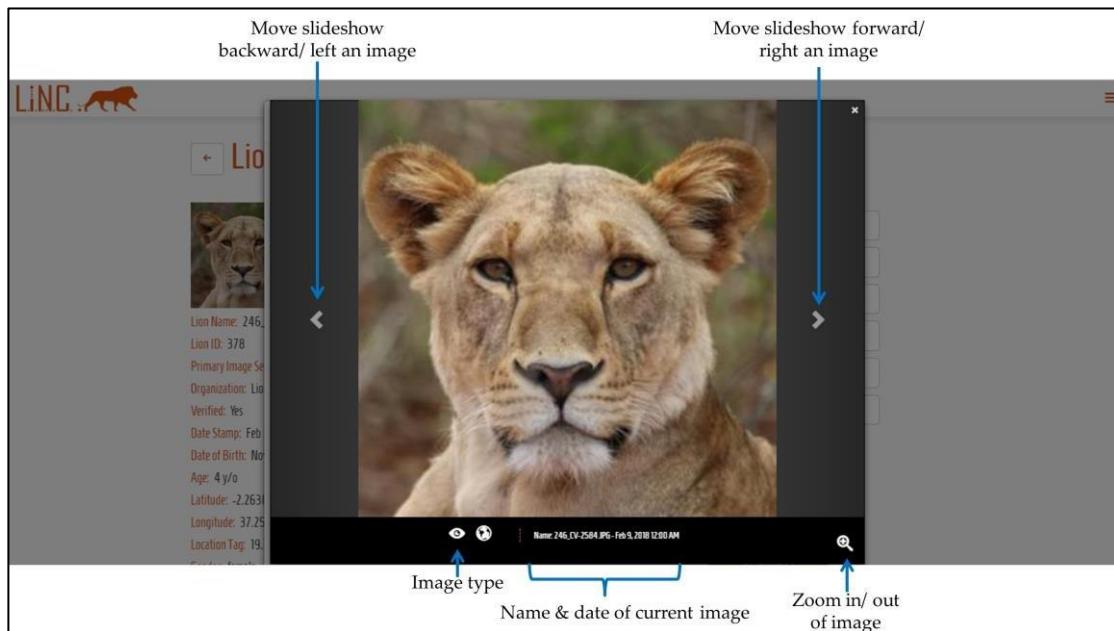
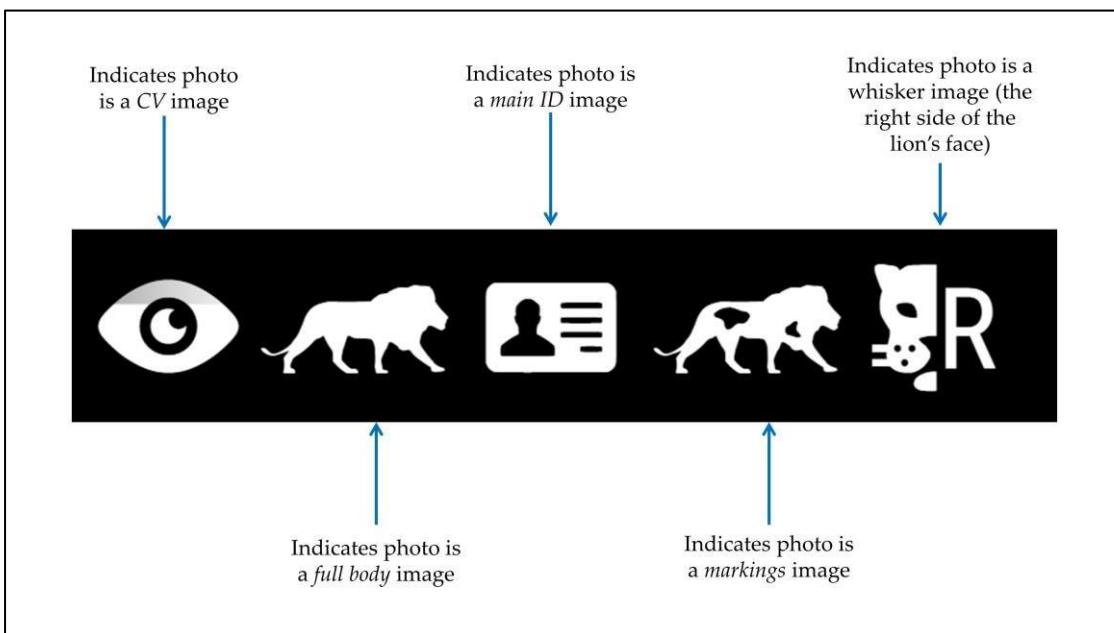


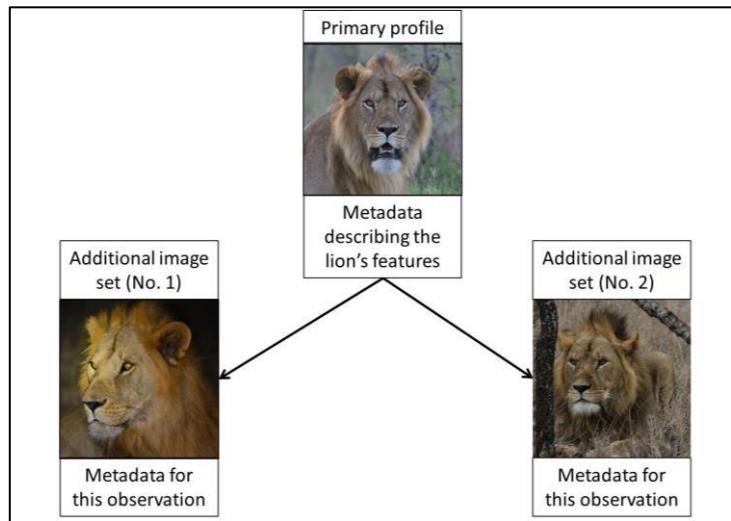
Image type tags are indicated below each photo:



### Viewing associated image sets

Each individual lion has **one** primary profile; this is a set of data and photographs that best identify the specific individual, as chosen by the user adding the data. When the same individual lion is observed in the field again after the primary image set has been created on

LINC users can upload an **additional image set** for this same lion, which is then linked to the primary profile. Each additional image set therefore represents a particular time that the lion was observed in the field.



From the lion's primary profile, you can also look into its associated/linked image sets. To do so, [navigate to its primary profile](#) and then click the **LION IMAGE SETS** button. This will provide a list of all the image sets associated with this individual.

The screenshot shows the LINC software interface for a lion named '095\_Marti'. The main area displays the lion's face, name, ID, and various metadata fields. To the right, there is a 'Notes' section with a note about eye-spots and ear nicks, followed by a 'Relatives' table and a list of 'LION IMAGE SETS'.

<b>Id</b>	<b>Lion</b>	<b>Relation</b>
171	313	Cub
172	314_Koyombo	Cub
173	315_Mapitet (Moshi Cub C)	Cub
176	317_Nteng'enda	Cub
177	319	Cub
181	335_Lechani	Cub
186	349	Cub
187	350	Cub
189	352	Cub
308	318_Noolayiok	Cub
372	235_Nekompewa	Associate
374	237_Nesidai	Associate
376	244_N'genoi	Associate

**LION IMAGE SETS** button is highlighted with a dashed blue box.

Each additional image set is shown as a new row underneath the primary image set.

This particular lion has only one additional image set (listed beneath the primary image set):

Primary image set																
Id	Photo	Lion Name	Lion Id	Age	Dead	Organization	Gender	Latitude	Longitude	GPS Points	Private	Time Stamp	Features	Verified	Primary	Actions
125		095_Marti	69	8 y/o		Lion Guardians	male	-2.304953	37.079095	✓		2016-03-17	ⓘ	✓	✓	<a href="#">DISASSOCIATE</a> <a href="#">SET PRIMARY</a>
331		095_Marti	69			Lion Guardians	male	-2.362550	37.323029	✓		2016-11-10	ⓘ	✓	x	<a href="#">DISASSOCIATE</a> <a href="#">SET PRIMARY</a>

The primary image set is indicated by a green tick under the column titled 'Primary' while all additional image sets are marked with a red X under 'Primary' to indicate that they are not the lion's primary set, but they are associated/linked with this lion.

## Viewing location information

The lion's primary profile also includes location data. To look at the GPS points for this lion's recent observations, click POSITION ON MAP.

### Lion Info



Lion Name: 246\_Sunkuroi  
Lion ID: 378  
Primary Image Set ID: 622  
Organization: Lion Guardians  
Verified: Yes  
Date Stamp: Feb 25, 2018  
Date of Birth: Nov 1, 2013

Notes:

Relatives:

ID	Lion	Relation
40	189_Loolaimutiaik	Associate
99	111_Meoshi	Mother
377	245_Nawishie	Sibling

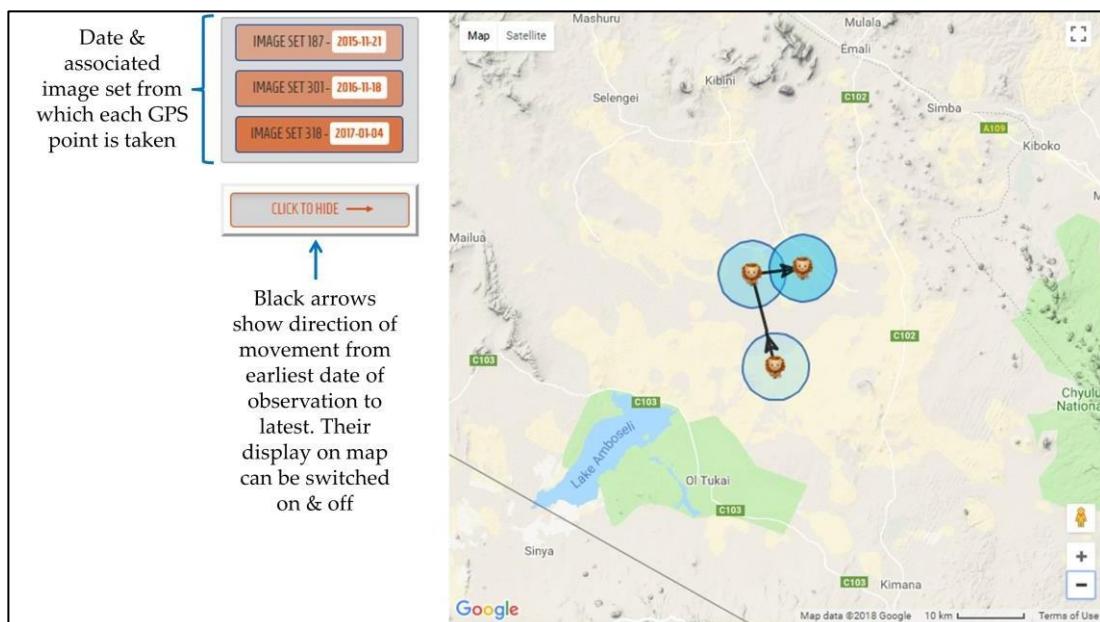
[IMAGE GALLERY](#) [POSITION ON MAP](#) [EDIT METADATA](#) [RELATIVES](#) [LION IMAGE SETS](#) [DELETE LION](#)

This will open up a map showing the GPS positions of the individual for each of its observations (image sets).



If there is only one image set (that in the primary profile), there will only be one lion 'pin' dropped on the map (as above). If the lion has more than one image set, there will be multiple pins on the map in the primary profile page, showing each of the different locations of each image set for this lion (as below).

*This lion has 1 primary image set (from 21<sup>st</sup> November 2015) and 2 additional image sets (on 18<sup>th</sup> November 2016 & 4<sup>th</sup> Jan 2017) and it has moved a short distance between each of these observations:*



## ADDING TO THE LION DATABASE - SUGGESTED WORKFLOW

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Once you have taken a look around LINC, you can start building your organization's database. This involves adding all the lions from your study area onto the online database.

Best practice when setting up your database is to follow the below workflow:

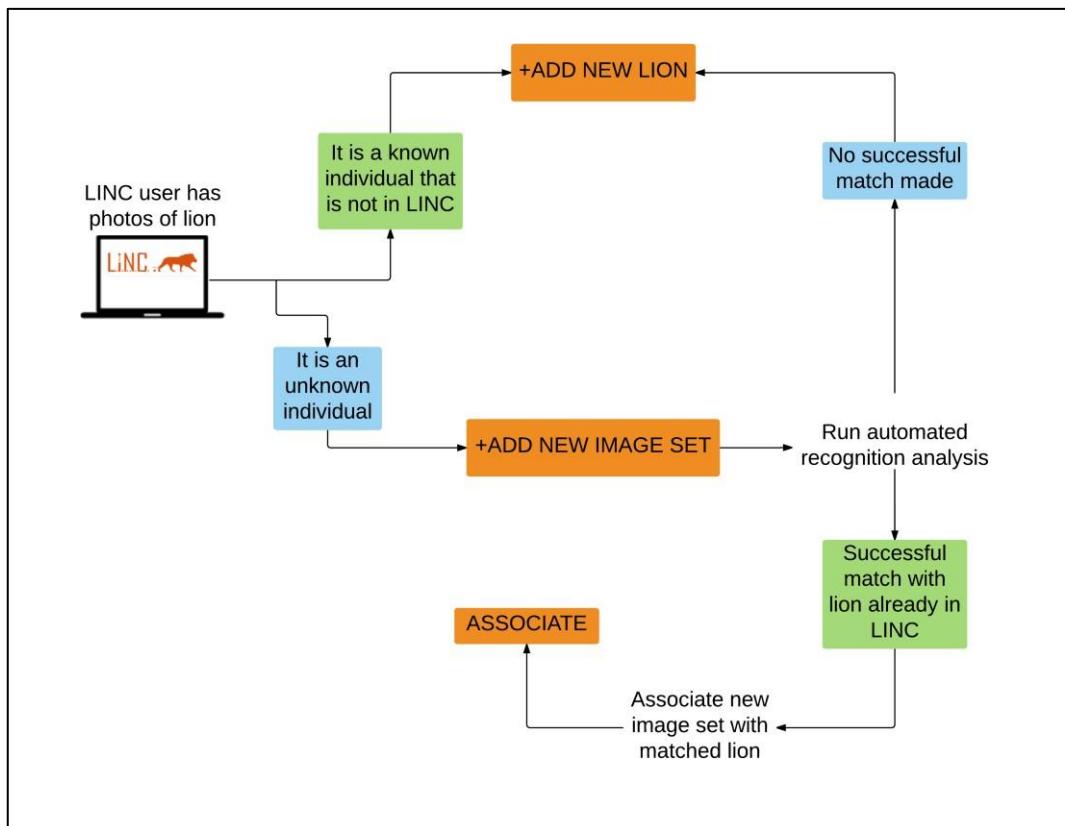
1. If you are certain that a lion is new to the LINC database, in other words you are sure that this lion isn't already part of someone else's LINC database, you can [add it as a new lion](#). This is normally the case for new cubs born to prides in your study area.
2. However, conservationists' study areas often overlap in places and because lions, especially males, can move vast distances over their lifetime, it is possible that an individual in your ecosystem has moved from another area (and so it may already have existing data on LINC, put in by another organization). It is therefore best to first [add a lion into LINC as an image set](#), and then check it against existing lions in the LINC database using the [automated lion identification tool](#).

Note:

- If the GPS points for this lion are set to be private by the owning organisation, you (as an outside organisation) will not be able to see their data on the map.
- All data from your own organisation's lions should always be visible to you.

3. If the automated identification tool confirms that the lion already exists in the database, you can [associate/link your photos and data with the existing lion's primary profile](#), to avoid duplication of individuals. If the results show that there is no existing record of that individual lion in the database, then you can add it as a new lion.

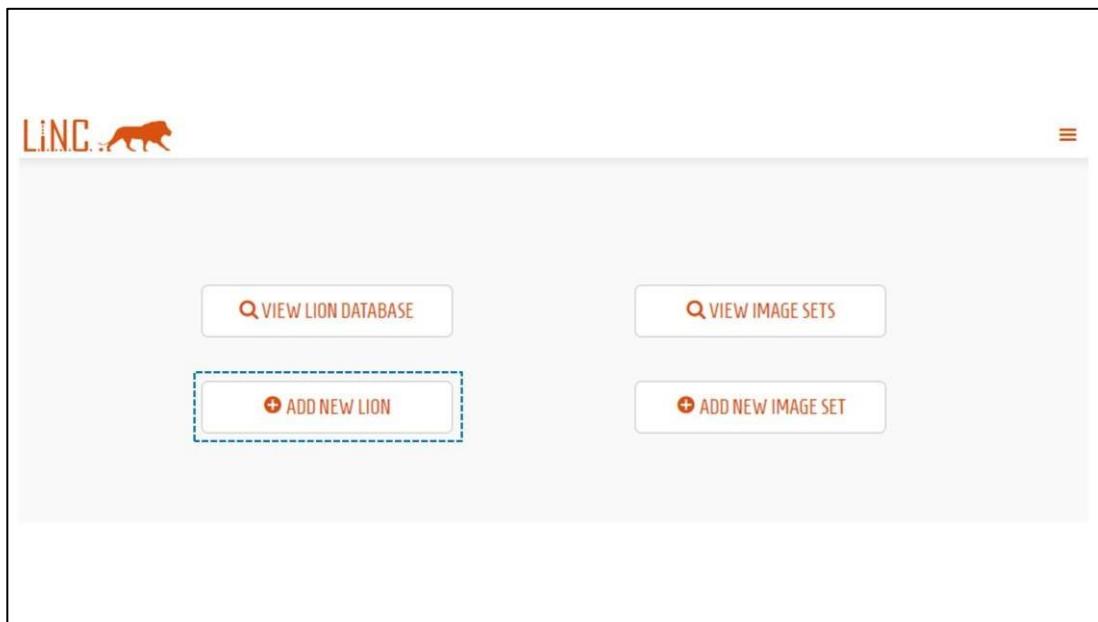
See below for details on how to work through these steps.



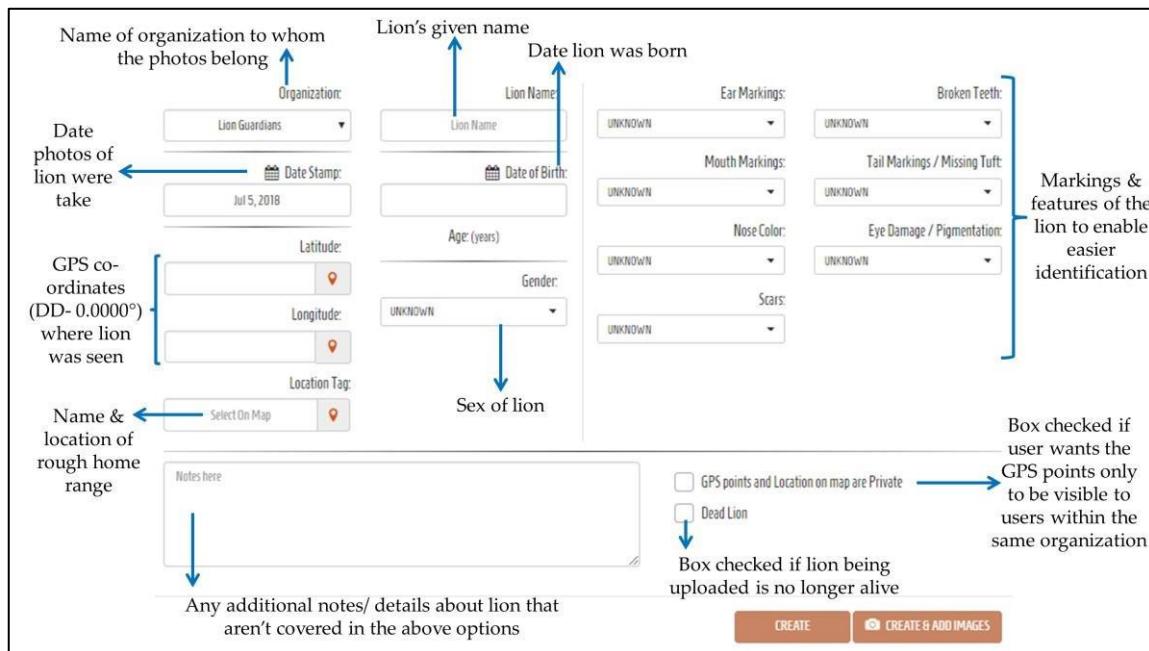
## Adding a new lion

When adding a **new** lion to the database, you must be sure that there is no existing record of this same individual on LINC already.

To add a new lion into the database (i.e. create its primary profile), go to the homepage (click the  logo), then select **ADD A NEW LION**:



Fill in the appropriate metadata for this lion in the dialogue box, where possible:



The form is divided into several sections:

- Name of organization to whom the photos belong**: Organization dropdown (Lion Guardians) and Date Stamp (Jul 5, 2018).
- Lion's given name**: Lion Name and Date of Birth.
- Date lion was born**: Date Stamp (Jul 5, 2018) and Age (years).
- Sex of lion**: Gender dropdown (UNKNOWN).
- Ear Markings**, **Mouth Markings**, **Nose Color**, **Tail Markings / Missing Tuft**, **Eye Damage / Pigmentation**, and **Scars**: Various dropdown options.
- GPS coordinates (DD- 0.0000°) where lion was seen**: Latitude and Longitude inputs.
- Name & location of rough home range**: Select On Map button.
- Notes here**: A large text area for additional notes.
- Any additional notes/ details about lion that aren't covered in the above options**: A text area for notes not listed in the main sections.
- Checkboxes at the bottom**:
  - GPS points and Location on map are Private
  - Dead Lion
- Buttons at the bottom**: CREATE and CREATE & ADD IMAGES.

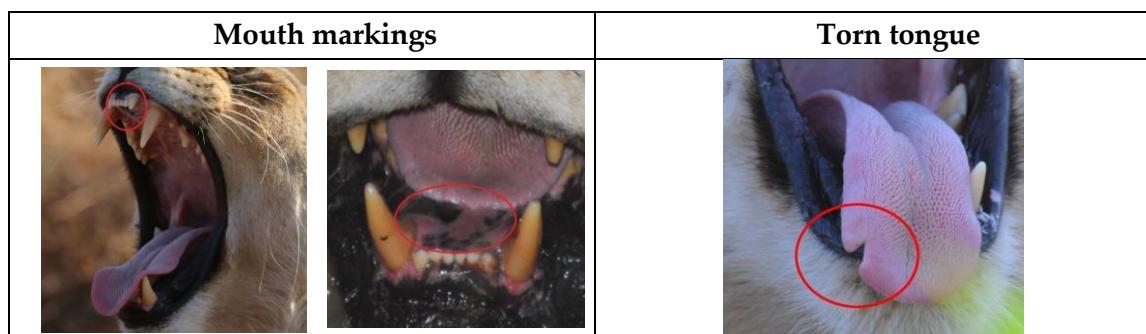
Annotations on the right side of the form:

- A bracket labeled "Markings & features of the lion to enable easier identification" covers the ear, mouth, nose, tail, eye, and scar sections.
- A bracket labeled "Box checked if user wants the GPS points only to be visible to users within the same organization" covers the GPS coordinates section.

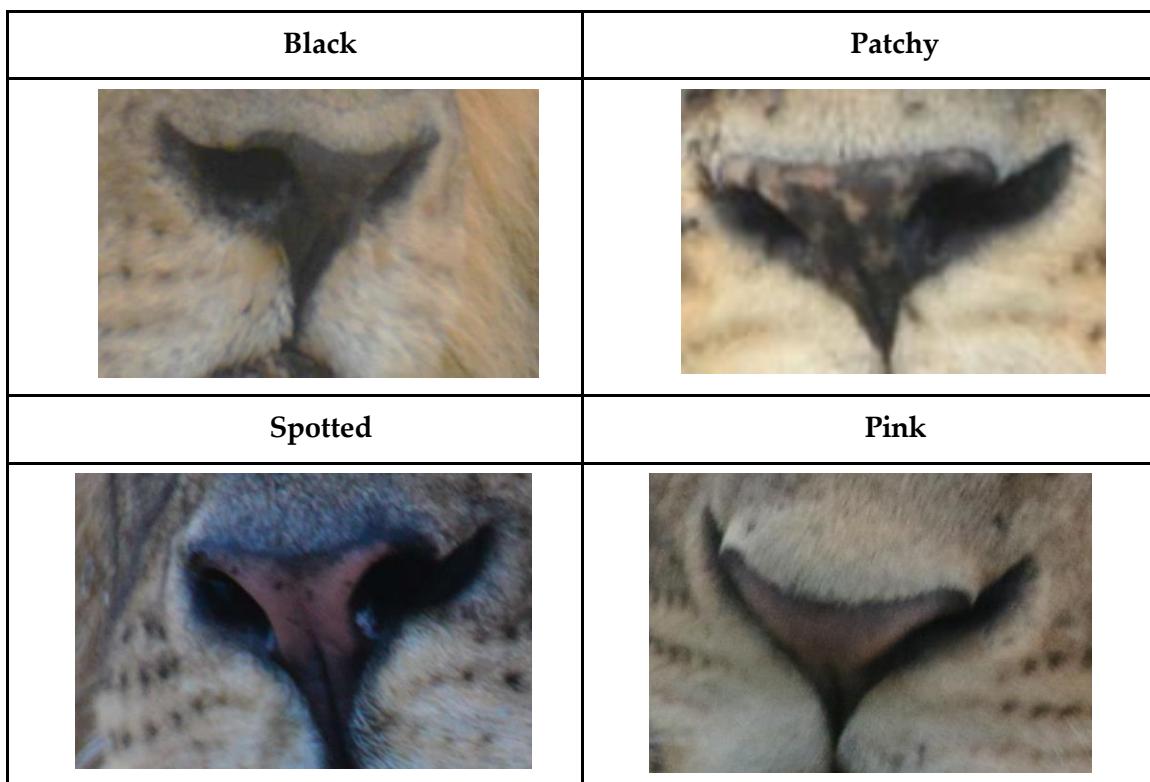
- **Organization**: The name of your organization (the owner of the data and photographs).
- **Lion Name**: The name and/or code of the lion (if given by your organization).
- **Date Stamp**: The date on which the lion was last observed. In the primary image set you may set this as the date of the most recent photo, in additional image sets all photos will

likely be taken on the same date, so enter this date.

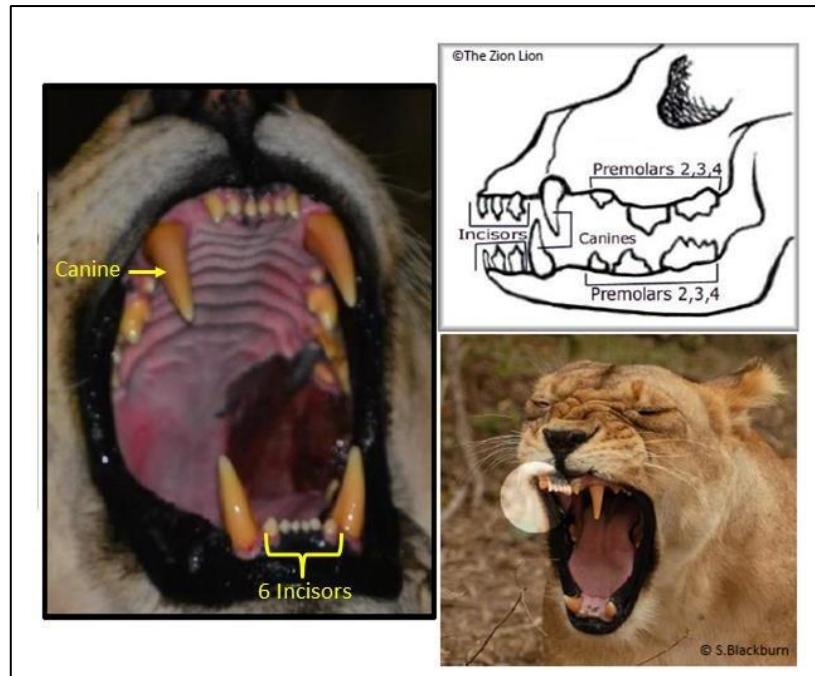
- **Date of birth:** The date on which the lion was born (you can enter a rough estimate or the exact date if known). This can also be left blank if you are unsure of the birthdate.
- **Age:** This is automatically calculated, based on the birthdate you entered.
- **Latitude/Longitude:** The GPS co-ordinate where the lion was seen during the observation. This can only be entered in Decimal Degrees format (e.g. Lat: -2.665363, Long: 37.821499).
- **Gender:** The sex of the lion (male/female/unknown).
- **Ear markings:** Note whether the lion has any distinct ear markings (notches/nicks/slices) on its left ear by selecting '*left*', or right ear by selecting '*right*'; if it has markings on both ears then select '*all ear markings*'; if there are no markings on the ears select '*none*'; if you do not have a clear photo or idea of the ear markings select '*unknown*'.
- **Mouth markings:** If the lion has any markings (dark colorations/torn tongue) inside its mouth select '*yes*'; if there are no markings in its mouth select '*none*'; if you have no clear photos or idea of the mouth markings select '*unknown*'.



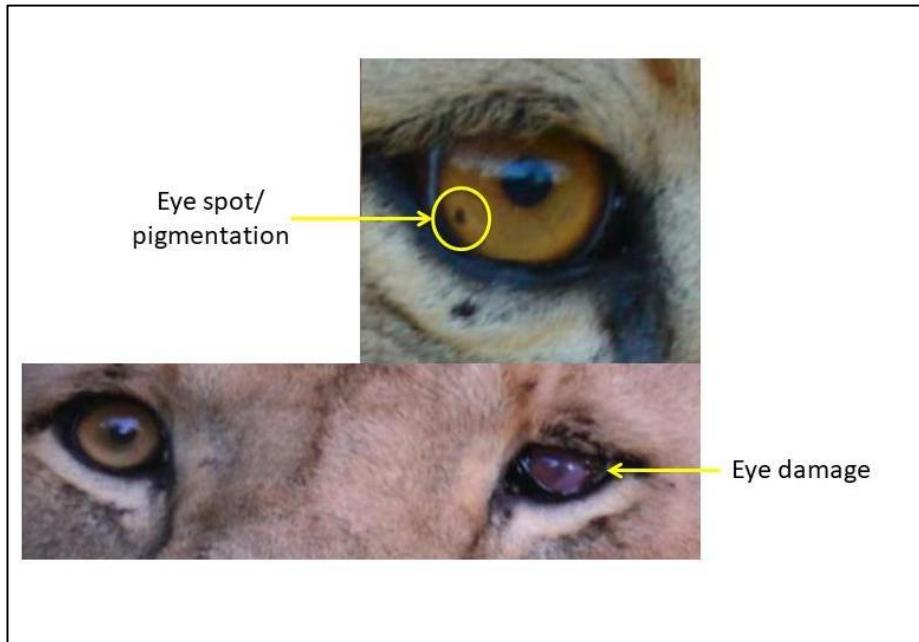
- **Nose colour:** Note whether the lion has a '*black*' '*patchy*', '*spotted*' or '*pink*' nose.



- **Scars:** Note if the lion has distinct scars on its body (left or right), tail and/or face; if there are no scars, select 'none'; if you have no photos or knowledge of scars, select 'unknown'.
- **Broken teeth:** Note if the lion has any broken teeth (either the left or right canines and/or incisors); if not then select 'none'; if you have no photos of the mouth or knowledge of what the teeth look like, select 'unknown'.



- **Tail markings/missing tuft:** Note if the lion has a distinctive tail, for example it might be missing a tuft, or has a specific marking. If so, then select 'Yes', if not then 'No'; if you have no photos of the tail or knowledge of what the tail looks like select 'unknown'.
- **Eye damage/pigmentation:** Note if the lion has any permanent damage to either of its eyes, for example a scar, or a missing eye, if so then select 'Yes', also select 'Yes' if the lion has any distinct spots/pigmentation in its eye/iris. If it has no scars or pigmentation then select 'No'; if you have no clear photos of the eyes or idea of what the eyes looks like select 'unknown'.



- Once you've filled out the metadata, select **CREATE** or **CREATE & ADD IMAGES**:
  - CREATE** will add the lion to LINC and automatically open the lion's new profile page - You can go here directly if **you do not have photos** of this lion to upload.
  - CREATE & ADD IMAGES** will open a dialog box where you can upload photos (if available) of this individual.

**Metadata**

Organization: Lion Guardians	Lion Name: Lion Name	Ear Markings: UNKNOWN	Broken Teeth: UNKNOWN
Date Stamp: Jul 5, 2018	Date of Birth: UNKNOWN	Mouth Markings: UNKNOWN	Tail Markings / Missing Tuff: UNKNOWN
Latitude: UNKNOWN	Age (years): UNKNOWN	Nose Color: UNKNOWN	Eye Damage / Pigmentation: UNKNOWN
Longitude: UNKNOWN	Gender: UNKNOWN	Scars: UNKNOWN	
Location Tag: Select On Map			
<input type="checkbox"/> Notes here <div style="border: 1px solid #ccc; height: 40px; margin-top: 5px;"></div>		<input type="checkbox"/> GPS points and Location on map are Private <input type="checkbox"/> Dead Lion	
		<input style="background-color: #800000; color: white; padding: 5px; border: none; border-radius: 5px; width: 100px; height: 30px; margin-bottom: 5px;" type="button" value="CREATE"/> <input style="background-color: #800000; color: white; padding: 5px; border: none; border-radius: 5px; width: 100px; height: 30px;" type="button" value="CREATE &amp; ADD IMAGES"/>	

## Uploading pre-cropped images

When uploading images to a lion database or an image set, you will be given the option of uploading **pre-cropped photos** or processing photos with **auto-cropper**.

When uploading pre-cropped photos to LINC, it is important to note:

- The images must be JPG format.
- Smaller sized photos will upload quicker- it is recommended that each photo is compressed to a maximum size of 100 KBs before it is uploaded.
- The software does not allow duplicate photos (i.e. photos with the same name) to be uploaded, so save each cropped image with a unique name.
- Public photos can be viewed by the public (anyone with access to a LINC) and they can be downloaded, but the owning organization is still the only one that can edit/delete/change the image properties in LINC. Private photos cannot be viewed or downloaded by anyone other than the owners.
- **Remember you need to pre-crop the photographs of the lion, with a photo editing software, BEFORE you upload them to LINC. The photos will need to be cropped as shown in the table below.**

*Explanation of image types/crops required:*

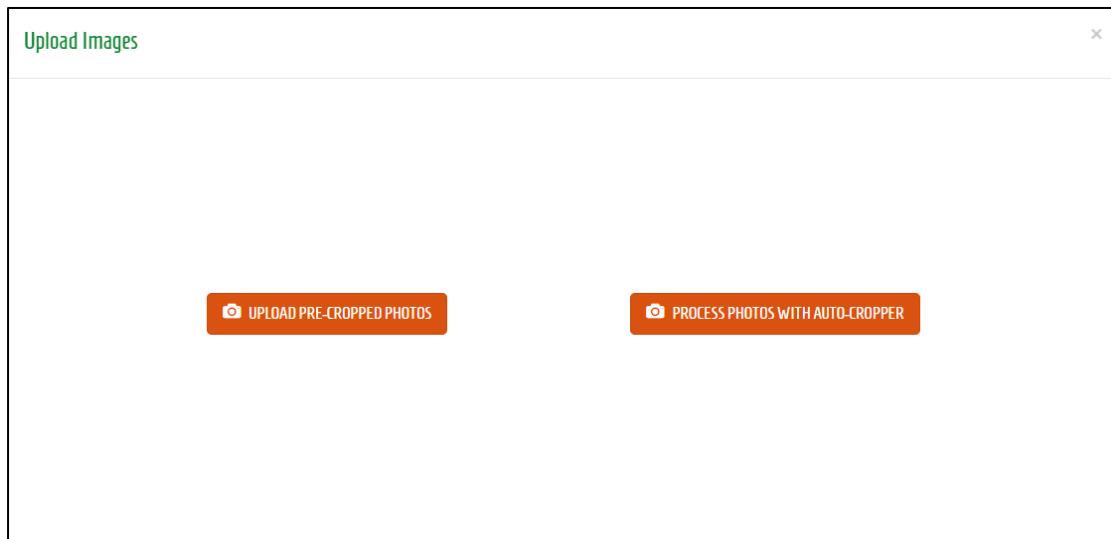


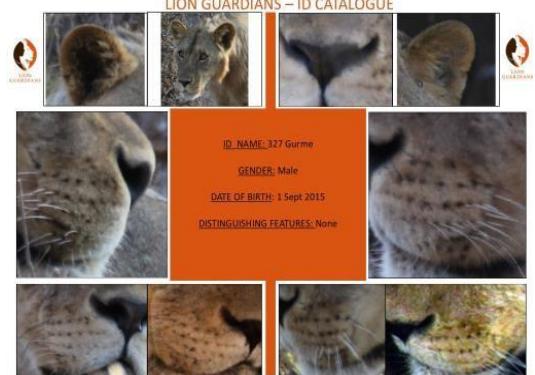
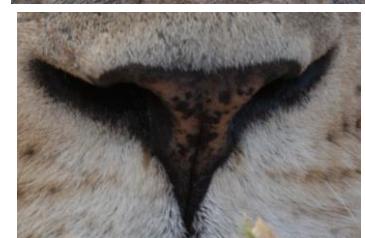
Image type	Description	Example
CV photo	<p>This is normally a portrait photo of the lion from the chin-tip of ear. The lion must be looking forwards.</p> <p>The photo must be cropped in a square (<b>1x1 aspect ratio</b>).</p> <p>The automated lion recognition tool works better the more CV photos there are, so try to get as many as possible.</p> <p><b>Do not include CV photos of lions less than 2 years old.<sup>1</sup></b></p>	
Full body	The entire lion (preferably one of the left and one of the right side).	
Main ID	<p>Photographs that will help a LINC user to identify a lion- these photos should enable the user to quickly pull out and look at the key photos. This is normally 1 portrait photo and a whisker photo from either side. If the lion has an existing ID catalogue you can add this as well (as shown here).</p> <p><b>These photos should be public.</b></p>	

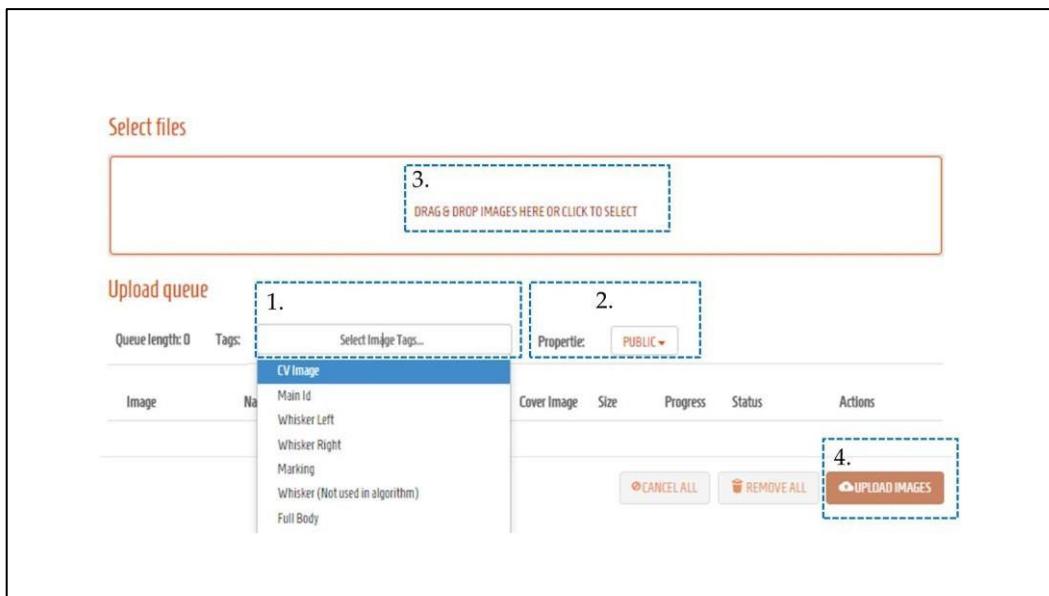
Image type	Description	Example
Whiskers Left & Right	<p>These photos will show a close up of the whisker spots on the lions left or right side.</p> <p>The photos for this image type are those that are completely horizontal/side-on (not angled).</p> <p>Try to get 2 clear photos on each side.</p>	 
Markings	<p>Photos showing any particular marking on the lion, on any area of the individuals. Normally includes ears, eyes, nose, mouth, tail and each side of its face in profile.</p> <p>There should be around 2-4 photos of each type of marking where possible.</p>	     

<sup>1</sup> This is because the facial structure of a lion changes dramatically between the ages 0-2 years old, so the facial recognition software cannot match lions based on photos of them as cubs.

To upload the cropped photos once you have clicked **CREATE & ADD IMAGES**:

- 1) You will need to define/tag the type of photo you are uploading (i.e. is it a CV image/full body/whisker (left, right, not for algorithm)/marking/main ID - See [pg. 20-21](#) for details) and decide whether the photo is to be set as '*public*' or '*private*'.
- 2) Start by adding all your CV images. Select **CV IMAGE** from the drop-down list of **Tags**.
- 3) Then choose whether you would like these photos to be '*public*' or '*private*' under the **Properties** drop-down.

Now all the images you load in this batch will be tagged as '*CV images*' and either *public/private* depending on your selection.



- 4) You can 'Drag and drop' all your cropped CV photos into the box; or you can upload your CV photos from a selected folder by clicking on the **DRAG & DROP IMAGES** button to navigate to the folder on the computer's drive where you saved the CV photos.
- 5) Once you have selected all your CV photos, you can start on the next batch of photos, '*Full body*' photos, by clicking the dropdown list of **Tags**, selecting **FULL BODY** and then repeating **step 2** for all you cropped *full body* photos of the lion. Then repeat these steps for all the different image types that you have cropped (*CV, Full Body, Whiskers Left/Right/not for algorithm, Main ID and Markings*).
- 6) You can tag one photo with more than one tag type if suitable, for example a *CV* or a *whisker* photo could also be a good *Main ID* photo. To do this simply select the additional tag from the dropdown list of **Tags** before uploading the image.
- 7) Once you have selected and tagged all your photos, you will see them in a list. From this list, you can change any settings for individual photos (remove it, change the tags or change it from private/public) if necessary.

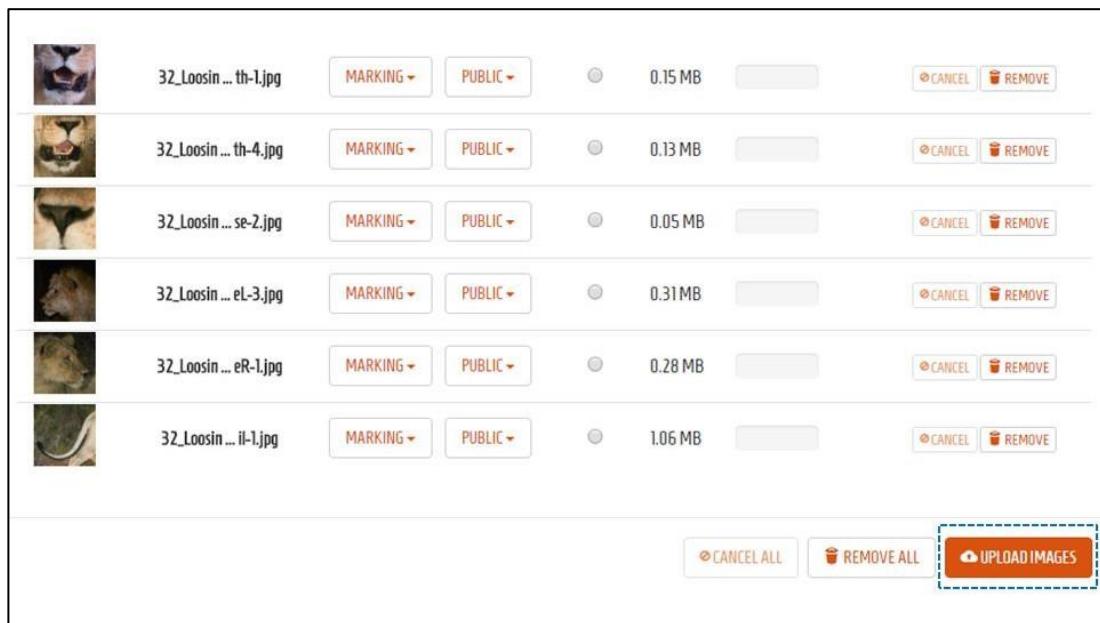
Upload queue								
Default Values: <a href="#">MARKING</a> <a href="#">FILE</a>								
Image	Name	Image type	Properties	Cover Image	Size	Progress	Status	Actions
	32_Loosin..._CV.JPG	CV IMAGE	PUBLIC	<input checked="" type="checkbox"/>	0.22 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._dy-3.jpg	FULL BODY	PUBLIC	<input type="checkbox"/>	0.27 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._dy-4.jpg	FULL BODY	PUBLIC	<input type="checkbox"/>	0.67 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._2193.JPG	WHISKER	PUBLIC	<input type="checkbox"/>	0.27 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._2202.JPG	WHISKER	PUBLIC	<input type="checkbox"/>	0.24 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._2205.JPG	WHISKER	PUBLIC	<input type="checkbox"/>	0.28 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	oosinkira... file.jpg	MAIN ID	PUBLIC	<input type="checkbox"/>	0.17 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._es-9.jpg	MARKING	PUBLIC	<input type="checkbox"/>	0.05 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>

- You can also select which photo you want as the cover photo, your favourite photo of this lion, by pressing the button under the column **Cover Image** in the row for your chosen photo. Remember that this is the “profile picture” of the lion and **must always be public**.

Photo selected as the cover image

Image	Name	Image type	Properties	Cover Image	Size	Progress	Status	Actions
	32_Loosin..._CV.JPG	CV IMAGE	PUBLIC	<input checked="" type="checkbox"/>	0.22 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._dy-3.jpg	FULL BODY	PUBLIC	<input type="checkbox"/>	0.27 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._dy-4.jpg	FULL BODY	PUBLIC	<input type="checkbox"/>	0.67 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._2193.JPG	WHISKER	PUBLIC	<input type="checkbox"/>	0.27 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._2202.JPG	WHISKER	PUBLIC	<input type="checkbox"/>	0.24 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._2205.JPG	WHISKER	PUBLIC	<input type="checkbox"/>	0.28 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	oosinkira... file.jpg	MAIN ID	PUBLIC	<input type="checkbox"/>	0.17 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>
	32_Loosin..._es-9.jpg	MARKING	PUBLIC	<input type="checkbox"/>	0.05 MB	<div style="width: 10%;">10%</div>	<a href="#">WORKS</a> <a href="#">RETRY</a>	<a href="#">CANCEL</a> <a href="#">REMOVE</a>

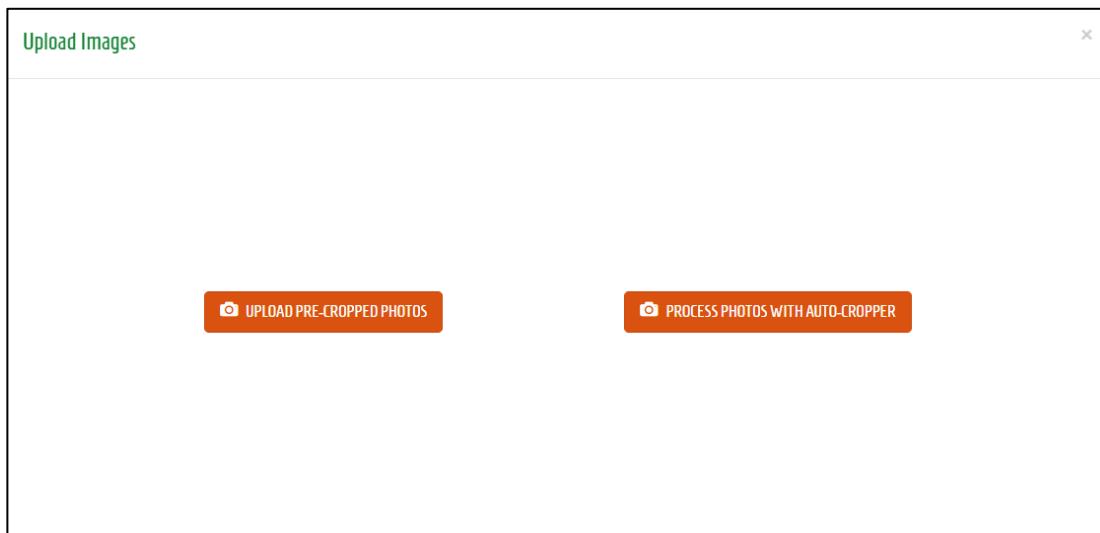
- 8) Once you've completed this process you will click the **UPLOAD IMAGES** button at the bottom right, under the list, and the photos will then be uploaded to LINC in bulk. After the upload is completed, the lion's new profile page will open automatically.



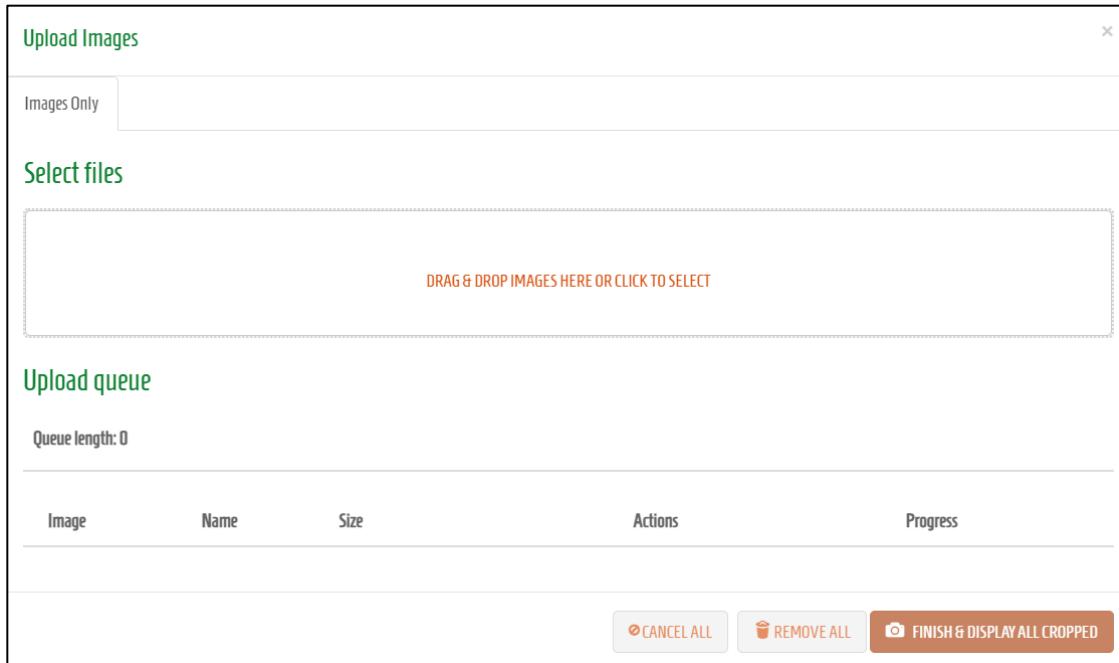
### Processing images with auto-cropper

The user can also upload photos using **auto-cropper**. Auto-cropper is a machine learning tool that detects areas of interest that are important for the ID algorithms and crops, labels, and stores them automatically under the image set created.

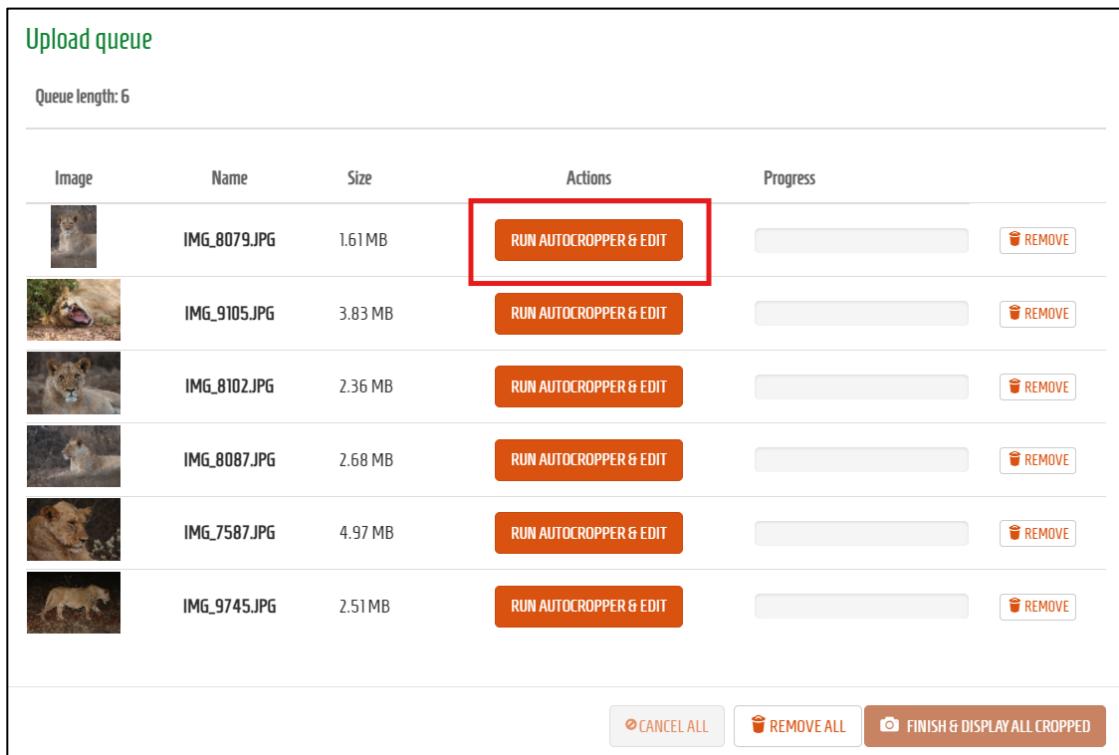
- 1) Once you have clicked **CREATE & ADD IMAGES**, and are presented with the **Upload Images** screen, you can click on the **PROCESS PHOTOS WITH AUTO-CROPPER** button and 'Drag and drop' all your photos into the box, or upload your photos from a selected folder by clicking on the DRAG & DROP IMAGES button to navigate to the folder on the computer's drive where you saved the photos. Please select a set of the



best photos of the observed lions, not every single photo taken. Photos should show various angles of the lion to extract the regions of interest.



- Once you have selected all your photos, click **RUN AUTOCROPPER & EDIT** for the first image.

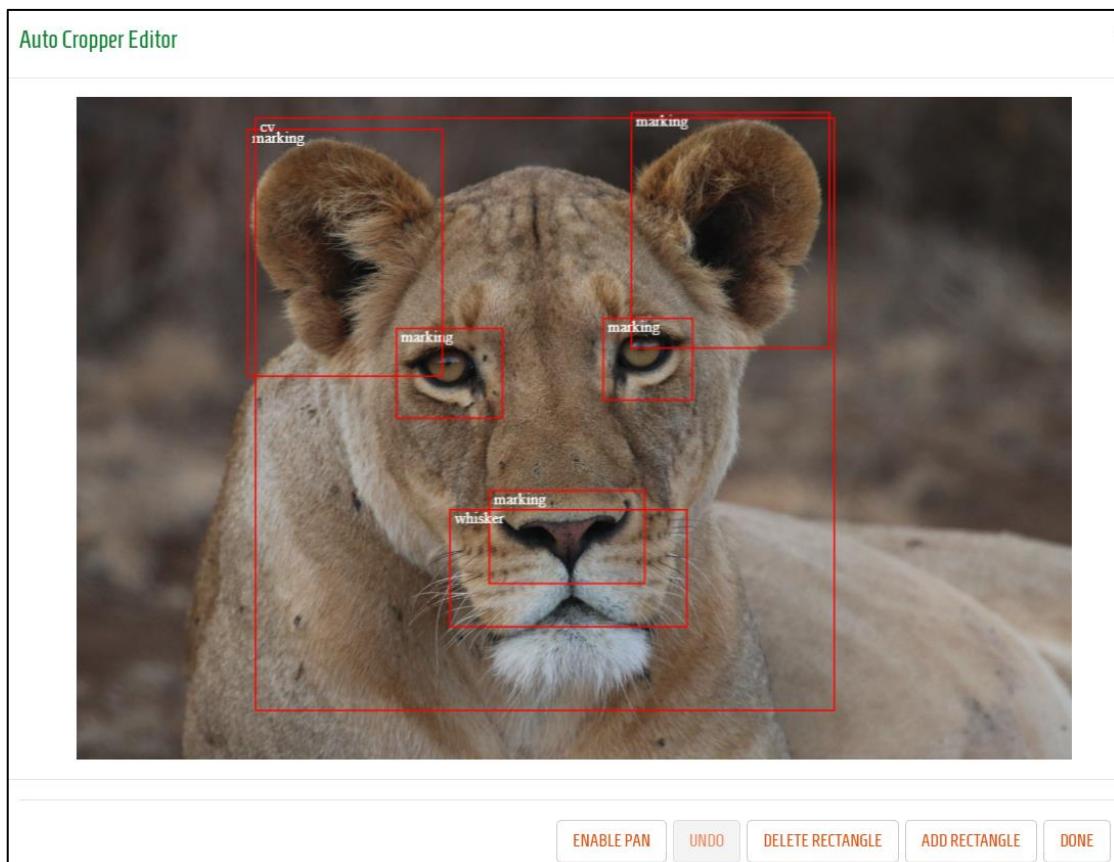


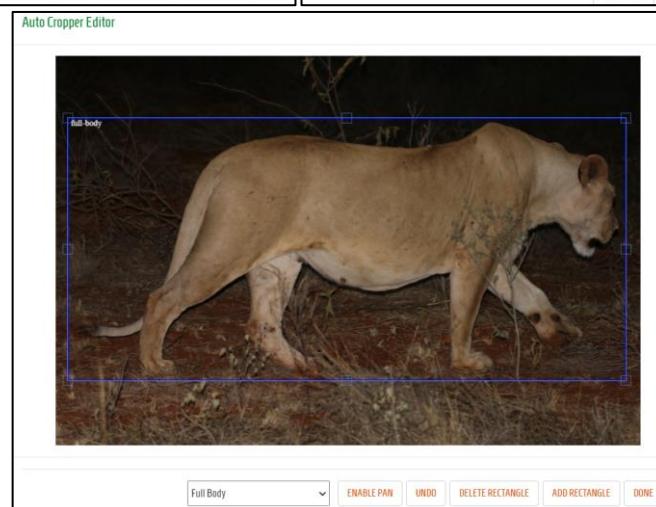
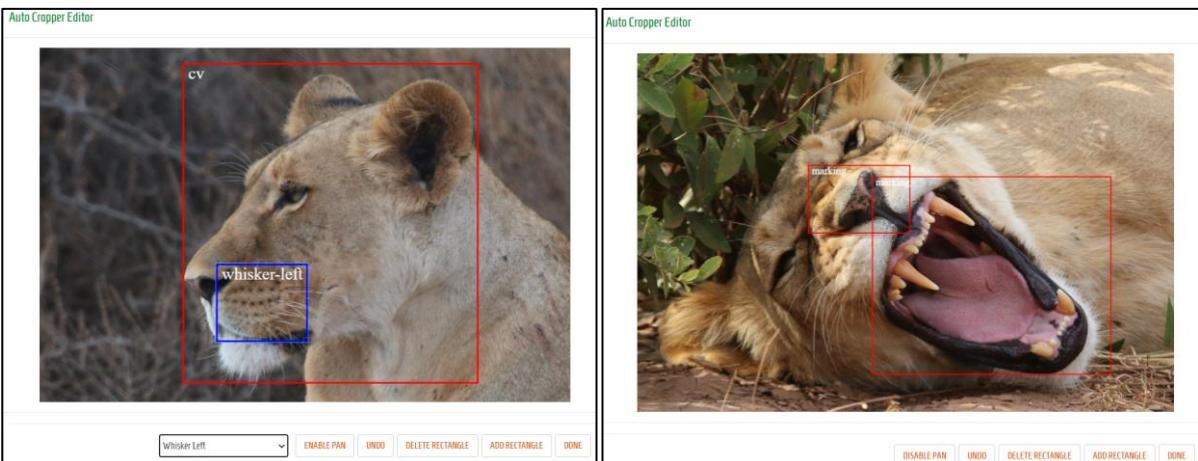
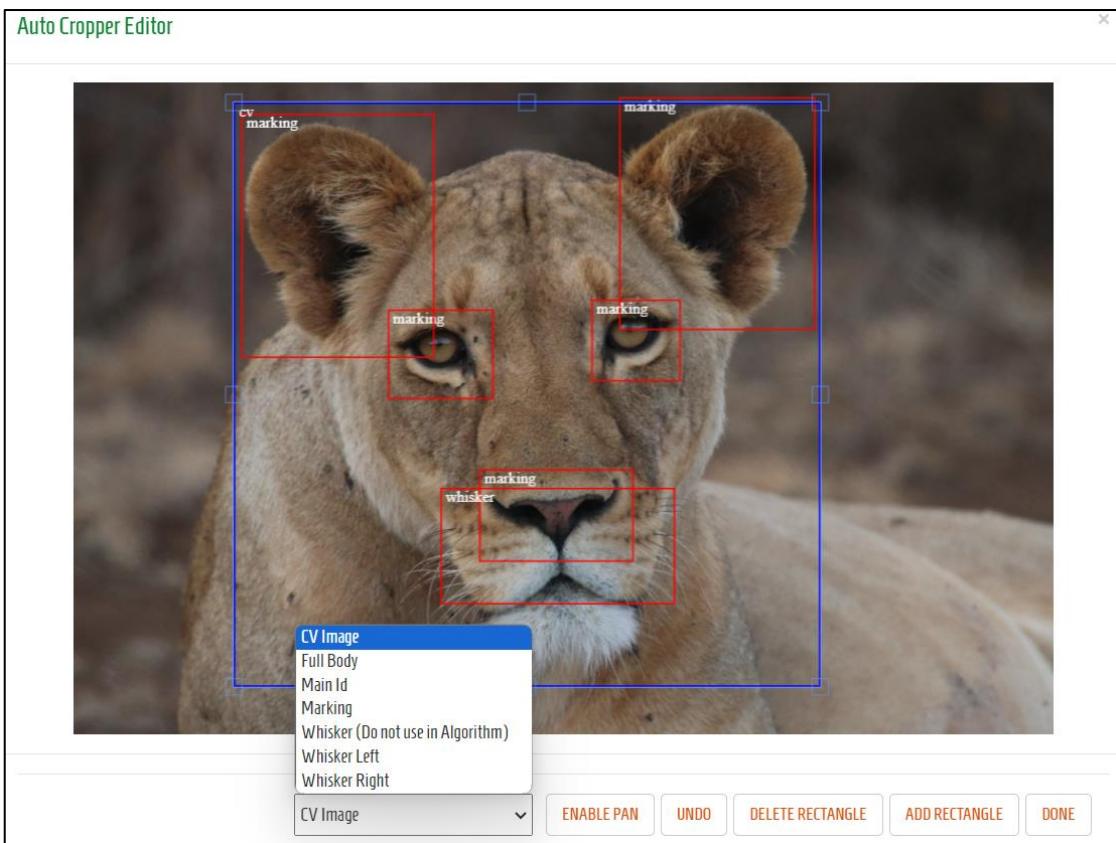
- You will be presented with the **Auto Cropper Editor** screen. You will find that all the areas of interest that are important for the ID algorithms have been automatically selected in boxes. By clicking on the boundary of a box or clicking and dragging across the whole area of the box, you can select it and perform several functions such as

changing the image tag, moving the position and resizing the box, and ultimately deleting the box if the selected area is not relevant to you.

- 4) The list of image tags provided includes *CV image*, *Full body*, *Main ID*, *Marking*, *Whisker (Do not use in algorithm)*, *Whisker Left* and *Whisker Right*.

- I. *Marking* – These include boxes that highlight ears, eyes, nose, teeth and any other markings on the body that can assist a human with a manual ID of the lion
- II. *Whisker (Do not use in algorithm)* – These are boxes that highlight whisker patterns that will help users to manually ID the lion but are not suitable for the computer's ID algorithm as they are the wrong angle.
- III. *CV*, *Whisker Left*, and *Whisker Right* – all critical for the computer algorithm to run the auto-ID tool.





- 5) The **Auto Cropper Editor** screen also allows you to pan across the image using the ‘enable pan’ function, undo any changes you may have made, and add a new rectangle crop box (areas of interest) if you wish to highlight another part of the lion that will help with IDing the lion. When you are satisfied that all boxes have highlighted the parts of the lion you want, click **DONE**.
- 6) Repeat Step 2 to run autocropper and edit the next image in your list. Repeat this step for all the images. Please note that you **CANNOT** click on the ‘run autocropper & edit’ function for all the images on your list at the same time, and that each image must be run separately otherwise the program will jam.
- 7) Once each image has been processed you may wish to make further changes to the cropped imaged, if so click ‘edit’ and you will return to the Auto Cropper Editor screen once again.
- 8) Once you have completed using the auto-cropper feature, click on **FINISH & DISPLAY ALL CROPPED**.

**Upload queue**

Queue length: 6

Image	Name	Size	Actions	Progress
	IMG_8079.JPG	1.61 MB	<b>EDIT</b>	<div style="width: 80%;"> </div>
	IMG_9105.JPG	3.83 MB	<b>EDIT</b>	<div style="width: 85%;"> </div>
	IMG_8102.JPG	2.36 MB	<b>EDIT</b>	<div style="width: 80%;"> </div>
	IMG_8087.JPG	2.68 MB	<b>EDIT</b>	<div style="width: 80%;"> </div>
	IMG_7587.JPG	4.97 MB	<b>EDIT</b>	<div style="width: 80%;"> </div>
	IMG_9745.JPG	2.51 MB	<b>EDIT</b>	<div style="width: 80%;"> </div>

**FINISH & DISPLAY ALL CROPPED**

- 9) All the important crops that the algorithm has extracted will be shown. Here you can change the image tags if the automated tag is incorrect, you chose whether you want your images to be public or private, choose a cover image for your lion, and remove any cropped images you don’t want in this image set. Remember that the cover image is the “profile picture” of the lion and must always be public.

Upload Images							
Image	Name	Image Tags	Properties	Cover Image	Progress	Status	Actions
	IMG_9105.JPG	MARKING ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_9105.JPG	MARKING ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_8093.JPG	WHISKER RIGHT ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_7585.JPG	MARKING ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_7585.JPG	CV IMAGE ×	PUBLIC ▾	<input checked="" type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_7585.JPG	MARKING ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_7585.JPG	MARKING ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_7585.JPG	WHISKER (NOT USED IN ALGORITHM) ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>
	IMG_7585.JPG	MARKING ×	PUBLIC ▾	<input type="radio"/>	<div style="width: 20%;">20%</div>	<span>READY</span>	<span>REMOVE</span>

- 10) Once you've completed this process you will click the **UPLOAD IMAGES** button at the bottom right, and the photos will then be uploaded. After the upload is completed, the lion's new image set/ profile will open automatically.

## Editing lion data in the primary profile

Once you've added an individual lion to LINC, you can still edit the metadata and photos in its primary profile.

### Editing metadata

To edit a lion's primary profile **metadata** (viewed as text under the cover image on the left), first select **EDIT METADATA**.

Lion Name: 119\_Mellyo (id: 81)

Organization: Lion Guardians

Lion ID: 119

Date Stamp: Apr 13, 2016

Primary Organization: Lion Guardians

Date of Birth: Apr 1, 2010

Age: 8 (years)

Latitude: -24.4697244

Longitude: 37.651214

Gender: MALE

Ear Markings: RIGHT

Mouth Markings: YES

Tail Markings / Missing Tuft: UNKNOWN

Nose Color: SPOTTED

Eye Damage / Pigmentation: UNKNOWN

Stars: UNKNOWN

Notes here:

GPS points and Location on map are Private

Dead Lion

**SAVE**

- Make the desired changes in the relevant fields and then select **SAVE** once completed. This will return you to the primary profile page and the saved changes should now be visible.

#### Note:

- Only change the metadata in the primary image set if there was a mistake, or there is an actual change in the individual lion over time, such as new ear notches or other markings.
- There is no need to update the GPS points as all new points associated with additional image sets are reflected in the map display in the primary profile ([see pg. 14](#)).

### Editing photos

After the lion's profile is created, you can upload more photos to a lion's primary image set, delete photos, and change the properties of photos (i.e. image type tags and/or privacy settings).

To add more photos, first open the **IMAGE GALLERY** in the lion's primary profile.

## Lion Info



**Lion Name:** 119\_Meliyo  
**Lion ID:** 81  
**Primary Image Set ID:** 137  
**Organization:** Lion Guardians  
**Verified:** Yes  
**Date Stamp:** Apr 13, 2016

**Notes:**

**Relatives:**

Id	Lion	Relation

IMAGE GALLERY

POSITION ON MAP

EDIT METADATA

RELATIVES

LION IMAGE SETS

DELETE LION

Click **UPLOAD IMAGES** (button on the bottom right side of photo gallery) and follow the normal procedure of adding photos to an image set ([see pg. 18](#)).

Select All    50 of 109 results returned. Load more? ▾

Order by:

Filter Edit

**Image Tags**

- CV Image
- Full Body
- Main Id
- Marking
- Whisker Left
- Whisker Right
- Whisker (Do not use in Algorithm)

**Properties**

- Public
- Private
- Joined Image
- Not Joined
- Cover Image
- Not Cover Image

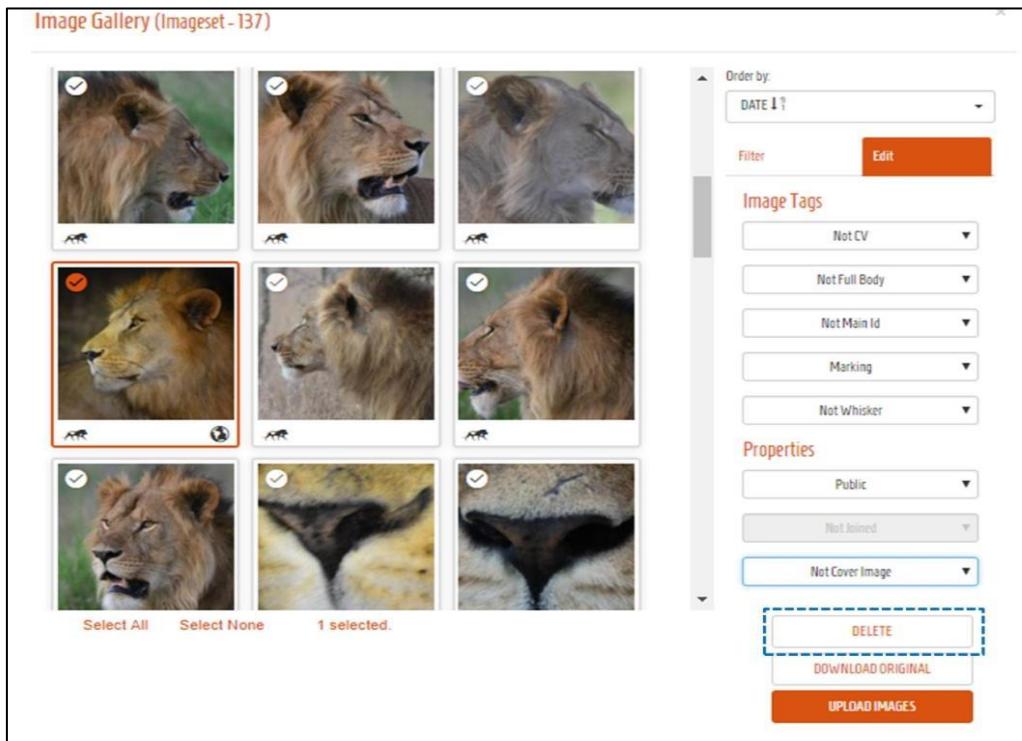
DOWNLOAD ORIGINAL

UPLOAD IMAGES

To delete a photo from an image set:

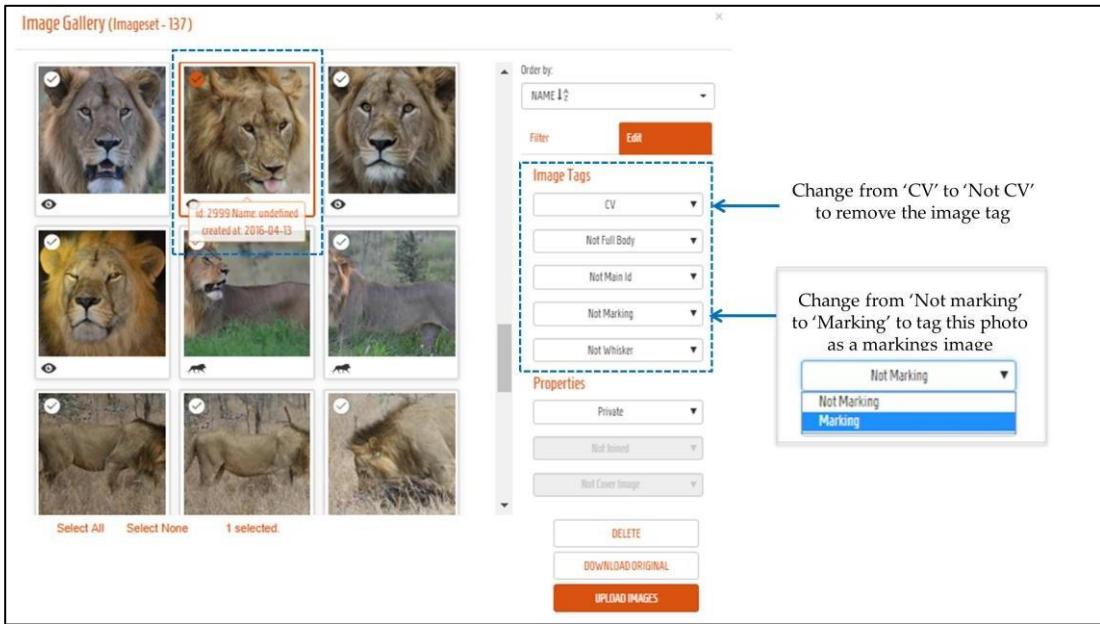
In the image gallery, select the photo(s) you want to delete (click the white tick button in the top left corner of each photo- it will turn orange when the photo is selected).

Then press the **DELETE** button to remove the selected photo(s) from this gallery. You will then receive a notification that the photo has been successfully deleted.

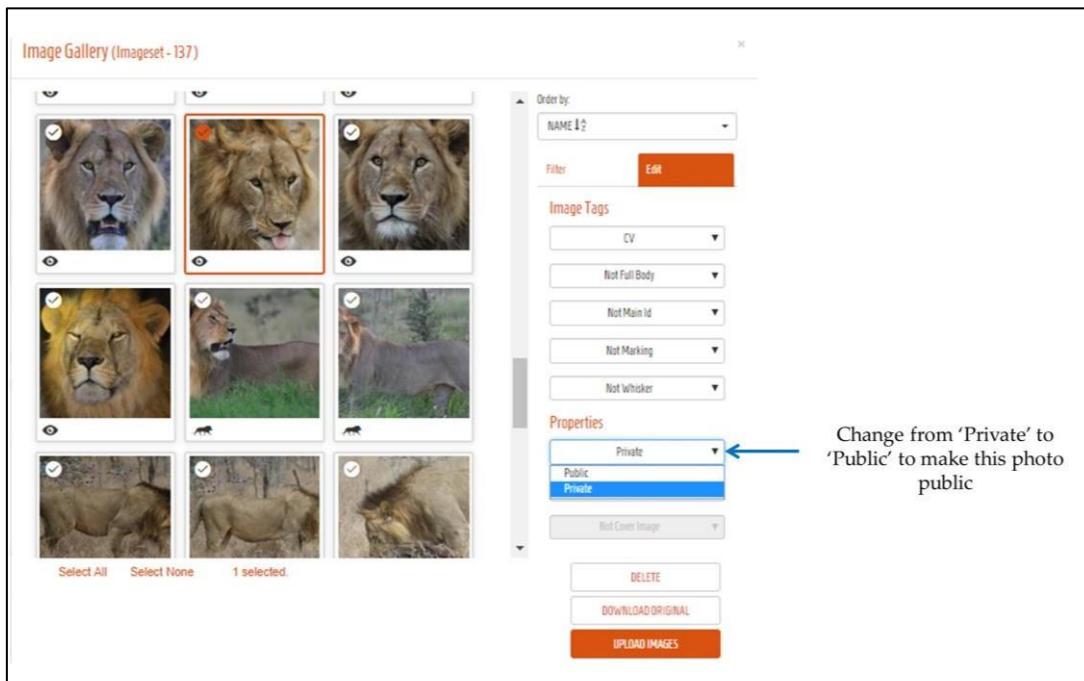


To change the properties of a photo (i.e. change its image type tag and/or privacy settings for this photo):

- Select the photo you want to change (click the white tick button in the top left corner of the photo)
- Under the list of **Image Tags** change each to the appropriate tag. For example, if you want to remove the CV tag for this photo press the dropdown button that says 'CV' and change it to 'Not CV' under the *Image tag* list. You will then receive a notification that the photo has been successfully changed.



- To change a photo from private to public, under **Properties** select the drop-down and change *Private* to *Public*.



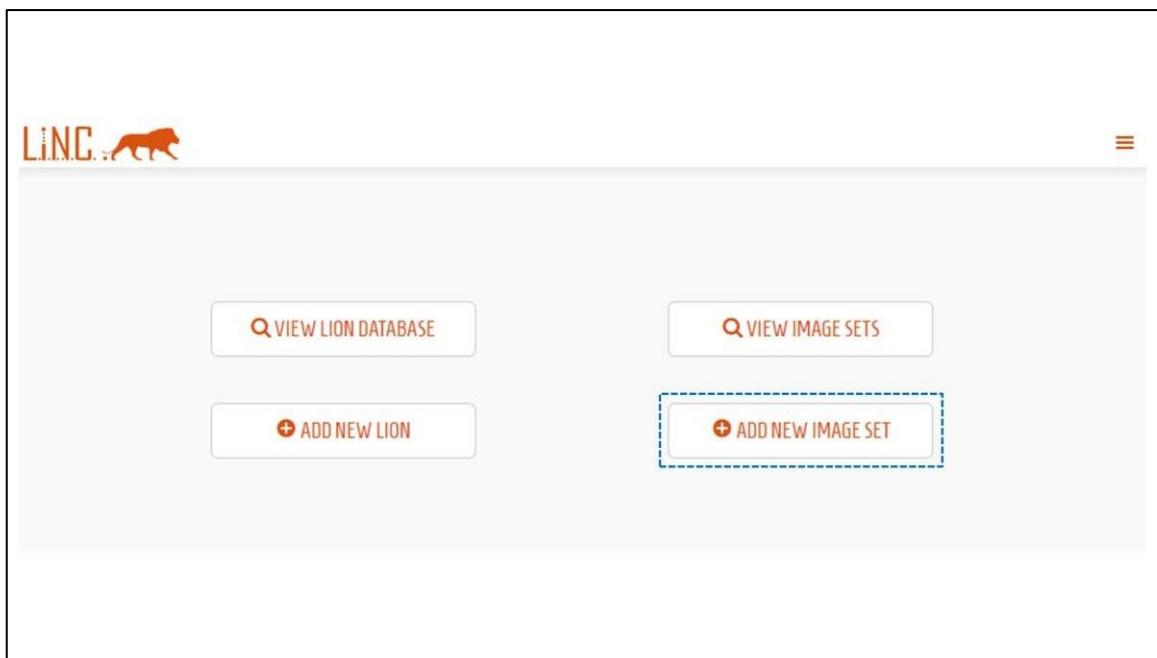
## **ADDING A NEW IMAGE SET/OBSERVATION FOR A LION**

Once a lion individual is in the LINC database, a **new image set** can be added and linked to its existing primary profile. Each new image set will represent each time the lion is sighted and photographed in the field. Each new image set will contain its own properties and metadata **related to that specific observation**, but the observation will be ‘linked/associated’ with this lion’s primary profile. When you open up the primary profile/image set, the additional image sets can be found and viewed within the primary profile ([see above, pg. 11](#)).

A new image set may also be added for an unknown lion, in order to run an automated lion identification search or simply to log this unknown individual in the database. This is discussed in more detail further on ([see pg. 44](#)).

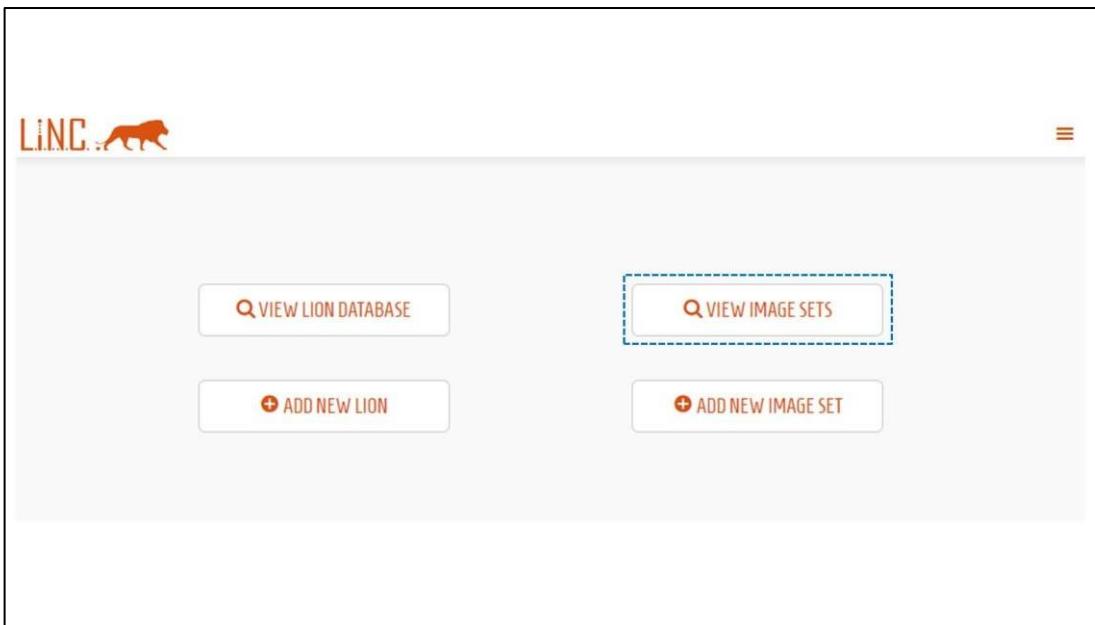
### **Adding new image sets**

To add a new image set/observation of a lion, go to the homepage (click the  logo) and press the **ADD NEW IMAGE SET** button.



Add the relevant metadata **for this specific observation** by following the same steps as when adding a new lion. Then add the photos for this observation. Note you will not add the name of the lion in the metadata at this stage, even if you do know who it is.

Once you have saved the metadata and uploaded the relevant photos from this observation, you will have created a new image set. This image set can be found in the list of other image sets when you click the **VIEW IMAGE SETS** button on the LINC homepage.



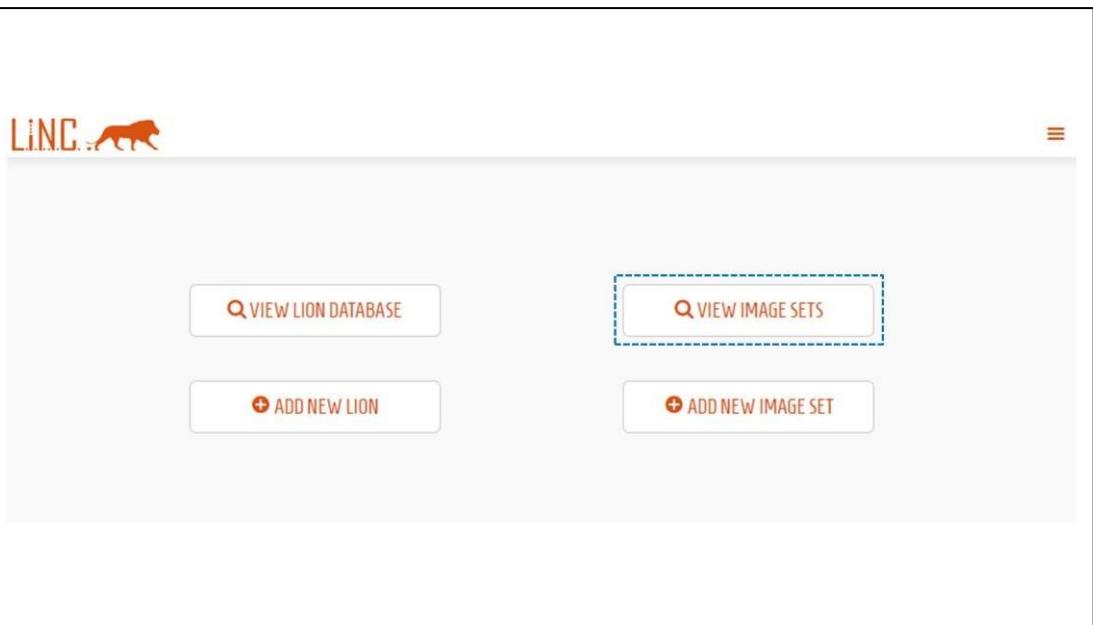
However, this newly created image set **is not yet linked to/associated with any lion individual in the database** (you can see there is no name written under the *Lion Name* field). To link this image set to the relevant lion, see below.

#### **Associating a new image set with an existing lion**

At this point you have created an ‘un-linked’ new image set for an observation of a particular lion. You may already know who this individual is, in which case you can manually link/associate the image set to the correct lion’s primary profile ([see following steps below](#)). However, if you do not know who the lion is in this image set, you can use LINC’s automated lion recognition tool to help you ([see pg. 44](#) for more details on how to do this).

In order to **manually** link this newly created image set to the correct lion’s primary profile, assuming that this lion is already in the LINC database:

You must open the new image set (it should automatically open when the image set is first created, however, you can also find the image set under **VIEW IMAGE SETS** on the homepage).



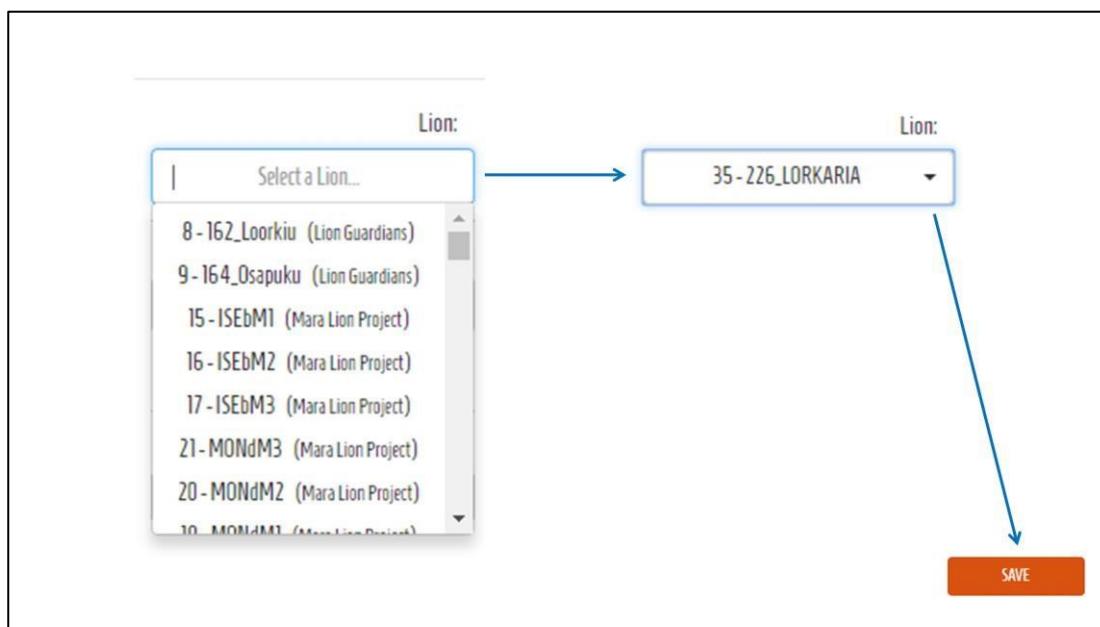
Once you have opened the relevant image set, click **EDIT METADATA**

The screenshot shows the 'Image Set Info' page. On the left, there is a thumbnail image of a lion's face. Below it, the 'Image Set ID' is listed as 538. Further down are fields for 'Lion Name' (empty), 'Lion ID' (empty), 'Organization' (Lion Guardians), 'Verified' (No), 'Date Stamp' (Feb 2, 2018), and 'Date of Birth' (empty). On the right, under 'Notes', it says 'Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls.)'. A sidebar on the right contains several buttons: 'IMAGE GALLERY', 'POSITION ON MAP', 'EDIT METADATA' (which is highlighted with a dashed blue border), 'FIND LION MATCH', 'SWITCH TO NEW LION', and 'DELETE IMAGE SET'.

Then click **ASSOCIATE** under the field **Lion**.

The screenshot shows the 'Edit Metadata' form. It includes fields for 'Organization' (Lion Guardians), 'Lion' (with a dropdown menu containing 'ASSOCIATE' which is highlighted with a dashed blue border), 'Date Stamp' (Feb 2, 2018), 'Date of Birth' (empty), 'Latitude' (-2.6198), 'Longitude' (37.19936), 'Age' (0 years), 'Gender' (MALE), 'Ear Markings' (RIGHT), 'Mouth Markings' (UNKNOWN), 'Nose Color' (SPOTTED), 'Tail Markings / Missing Tuft' (NONE), 'Eye Damage / Pigmentation' (NONE), and 'Scars' (UNKNOWN). At the bottom, there is a note about Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls.). Two checkboxes are present: one checked for 'GPS points and Location on map are Private' and one unchecked for 'Dead Lion'. A large orange 'SAVE' button is at the bottom right.

When this button is clicked, it will bring up a list of all known lions in the LINC database and you can select or type the correct lion's name from this list. Once selected, click save and this new image set will now be associated with the primary profile of the named lion selected.



This will take you back to the image set and you will now see the metadata for the name of the lion has been filled in. If you click on this name, it will take you back to this lion's primary profile.

Under the metadata section of the new image set, you will also see a new button **DISSOCIATE**. If you wish to 'un-link' this lion from the primary profile, you can click this button - only click this if you made a mistake and linked the image set to the wrong lion.

<b>Image Set ID:</b> 538	<b>Lion Name:</b> 226_Lorkaria	<b>Lion ID:</b> 35	<b>Organization:</b> Lion Guardians
<b>Verified:</b> Yes			
<b>DISASSOCIATE</b>			
<b>Date Stamp:</b> Feb 2, 2018			

- Notes:** Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls).
- IMAGE GALLERY**
- POSITION ON MAP**
- EDIT METADATA**
- SWITCH TO NEW LION**
- DELETE IMAGE SET**
- SET AS PRIMARY**

Please note that dissociating does not delete the image set, but simply 'un-joins' it. To delete the image set, [see pg. 37](#).

## Editing metadata & photos in an image set

The metadata of an associated image set can be edited the same way that you [edit a primary profile image set](#).

- First navigate to the image set you want to edit (by opening the primary profile of the lion, clicking **LION IMAGE SETS**, and then select the relevant image set row you wish to edit. [See pg. 11 for details](#) on how to view image sets).
- From here the steps are the same as editing a primary profile's metadata and photos ([see pg. 29 for details](#)): Select **EDIT METADATA** and make the changes necessary, then click **SAVE**; or open the **IMAGE GALLERY** and make the changes to selected photos.

### Note:

- Only change the metadata in additional (non-primary) image sets if you find a mistake or you are filling in something that was previously left blank

You can also delete the entire image set (this will only delete this specific image set/observation, the lion's primary profile will still remain on LINC).

- To delete an image set open the image set and click the **DELETE IMAGE SET** button on the right hand side.

The screenshot shows the 'Image Set Info' page for a lion named Lorkaria. On the left, there is a large thumbnail image of the lion's face. Below it, the following information is displayed:

- Image Set ID: 538
- Lion Name: 226\_Lorkaria
- Lion ID: 35
- Organization: Lion Guardians
- Verified: Yes
- DISASSOCIATE** button
- Date Stamp: Feb 2, 2018

On the right, there is a sidebar with several buttons:

- IMAGE GALLERY
- POSITION ON MAP
- EDIT METADATA**
- SWITCH TO NEW LION**
- DELETE IMAGE SET** (This button is highlighted with a dashed blue border.)
- SET AS PRIMARY

- Then click OK.



- You have now deleted the image set.

### **Updating primary profile photos using photos from associated images sets**

When you **add a new lion** to the LINC database (see [pg. 16](#)), the photographs that you upload at the time will become the *primary image set* for this lion (these should be the best photos of this individual to allow other LINC users to easily identify him/her). These photos can be viewed in the [image gallery of the lion's primary profile](#). However, it is possible that after some time, these photos will need to be updated with newer images of the lion, from later observations/additional image set if, for example, the lion has new markings or has aged substantially between observations.

LINC makes it easy to add photos from additional/associated image sets to the primary image set (i.e. the primary profile image gallery) - you can **select specific photos** from the associated image set to be viewed in the primary profile image gallery<sup>2</sup>.

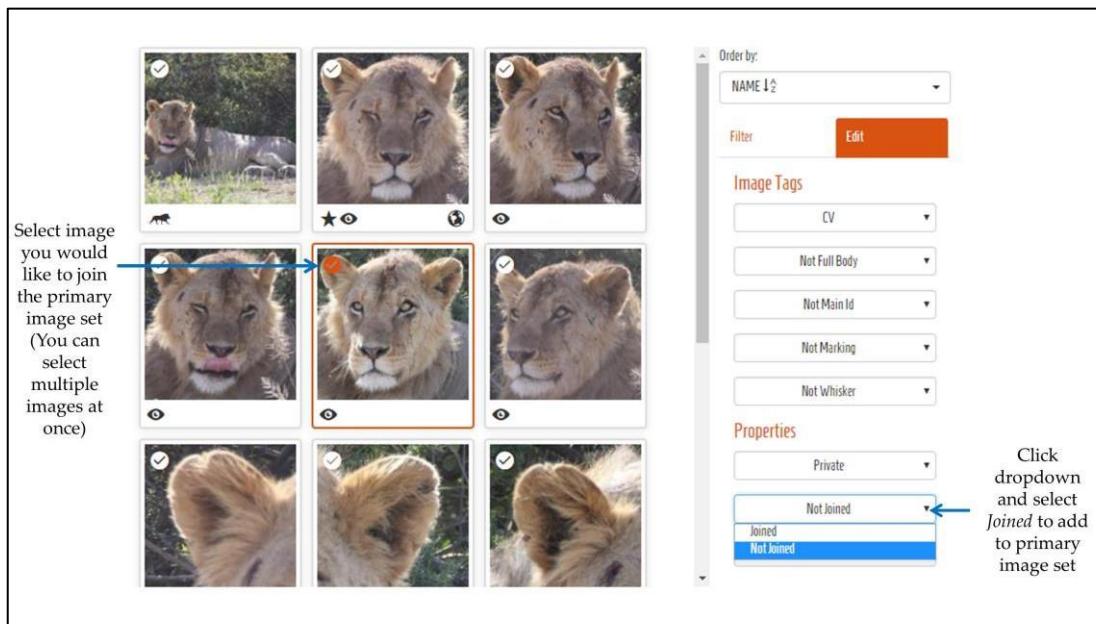
To do this:

- You open up the image gallery of the **associated** image set where the photos you want to add to the primary profile are located: Click **IMAGE GALLERY** once you have opened the relevant image set.
- Select the photos that you want to be added/viewed in the primary profile's image gallery by clicking on the tick box in the top left corner of each image (it will turn from white to orange once the image is successfully selected).

---

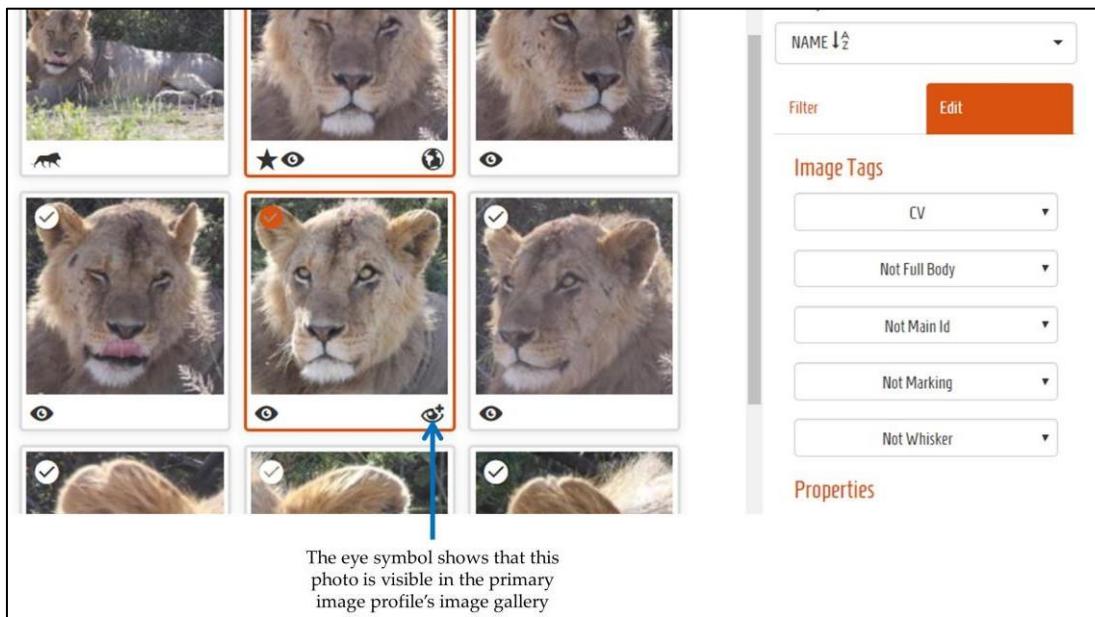
<sup>2</sup> The photos will also still be visible in the associated image set's gallery.

- In the dropdown under **Properties** change 'Not joined' to 'Joined'.

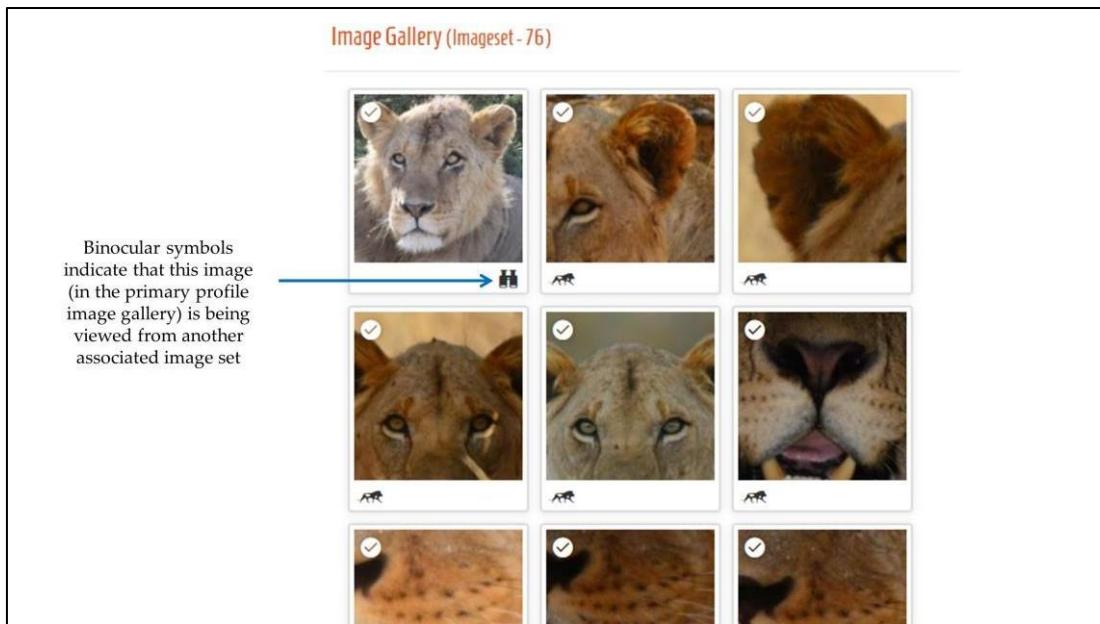


- These photos will now be visible in the gallery of the primary image set. They will also remain visible in the original image set.

The little *eye* symbol in the lower right hand corner of the picture indicates to you that the photo in this gallery has been joined to, and is visible in, the primary image set's gallery.



- If you are viewing the photos in the primary profile's image gallery you will see a little *binocular* logo in the bottom right of the photograph instead, to show that this image is originally from an associated image set.



- Other logos you might see on photos are a *star* on the bottom left corner of an image to show that this particular photo is the *cover photo*. You will also see a little *globe* in the right lower corner indicates that the photo is *public* to other LINC users.

**Image Gallery (Imageset - 125)**

This star indicates that this is the cover photo.

This globe means that the image is 'Public' and visible to anyone on LINC.

**Order by:** NAME  $\downarrow\wedge$

**Image type:**

- All
- CV Image
- Full Body
- Whisker
- Main Id
- Marking

**Properties:**

- Public
- Private
- Cover image
- Join Primary Image Set

**Actions:**

- DELETE**
- DOWNLOAD ORIGINAL**
- UPLOAD IMAGES**

## Resetting the primary profile

If you feel that a new image set (and its associated photos and metadata) are a better representation of this lion than its existing primary profile, you can reset this image set to become the primary profile/primary image set.

To do this:

- Open the new associated image set that you'd like to make into the primary profile/image set and click **SET AS PRIMARY** button on the right of the profile.

### Image Set Info



Image Set ID: 538  
Lion Name: 226\_Lorkaria  
Lion ID: 35  
Organization: Lion Guardians  
Verified: Yes

DISASSOCIATE

Notes:  
Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls).

IMAGE GALLERY  
POSITION ON MAP  
EDIT METADATA  
SWITCH TO NEW LION  
DELETE IMAGE SET  
**SET AS PRIMARY**

- This image set is now the new primary profile for this individual.

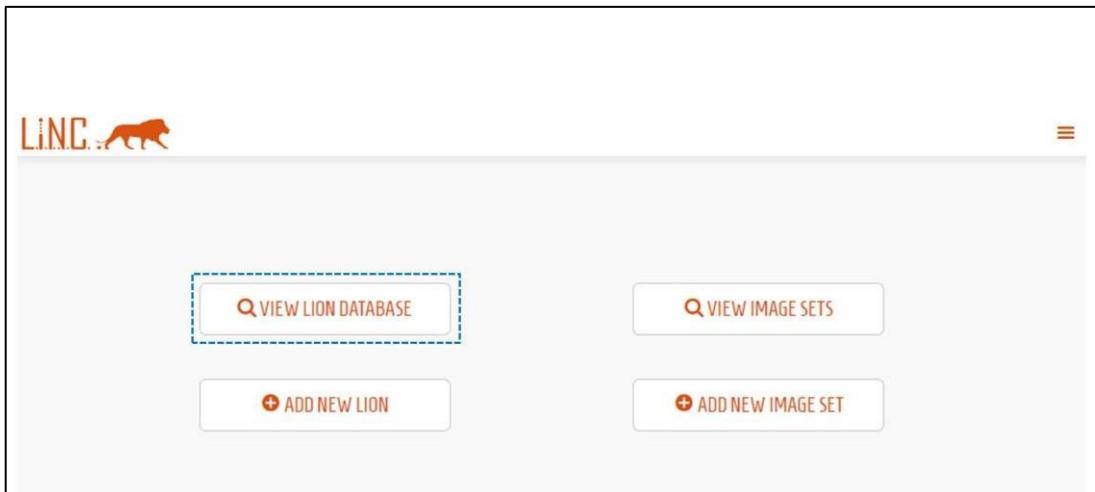
## **USING LINC TO IDENTIFY UNKNOWN LIONS**

LINC can help identify unknown lions, based either on a user's knowledge of its features or by analysing photographs via *computer vision (CV) technology to assess facial features and vector pattern recognition software to detect whisker matches*.

### **Searching for a lion based on knowledge of its features**

If you want to identify a lion and you know some of its basic features (like age, location, markings, etc.), you can run a search to find potential matches based on this information.

- First, click **VIEW DATABASE** on the homepage:



This opens up a page with a list of all the primary image sets/profiles of lions in the database.

- On the left side of the dialogue box is a filter **Refine by**. Under this, you can filter by specific features/data on the lion (such as *name of the lion, organization that uploaded lion, age, gender, features/markings and you can search by location*). For example, if you are looking for a lion within your organization's database that is between 0-5 years old and is a male, you would then select these details under the specific filters.

**View Lion Database**

47 lions found.

**Refine by**

<b>Name or ID</b>	<input type="text"/>
<b>Organization</b>	<input checked="" type="checkbox"/> Lion Guardians <input type="checkbox"/> Mara Lion Project <input type="checkbox"/> Ambi-Kapiti Lion Project <input type="checkbox"/> Guest <input type="checkbox"/> Rebuilding the Pride <input type="checkbox"/> KWS Amboseli National Park <input type="checkbox"/> Kope Lion <input type="checkbox"/> Seyerambu Conservancy <input type="checkbox"/> KWS-Nakuru National Park
<b>Age</b>	0-5 <input type="range" value="0-5"/> 32
<b>Gender</b>	<input checked="" type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Unknown

**Filters**

**GPS Points**

**Private**

**Date Stamp**

**Verified**

**Photo**

**Name**

**ImageId**

**Age**

**Dead**

**Organization**

**Gender**

**Latitude**

**Longitude**

**GPS Points**

**Private**

**Date Stamp**

**Verified**

Listed lions that match the description in the filter: 0-5 years old, males, from the Lion Guardians' database

- Lions with these selected features will be filtered out and displayed in the right side of the refining filter. You then manually look through the list of lions offered with similar features and determine if they match the unknown individual by comparing photos of their whiskers.

### Using the Refine filters:

- Name/ID-** Insert the lion's given name/code if known
- Organization-** tick all the organisation's whose lions you want to check against
- Age-** move the slider so that it displayed lions within the range of ages you want to see
- Gender-** tick the sex of the lions you want to see in the list
- Features** – return lions with specific markings. This filter is text-based. Results are therefore dependent on spelling- if you write 'ear marking right broken teeth left' it brings up lions with ear markings on right ear and broken incisors or canines on the left). However, if you write 'tooth' instead of 'teeth', it does not register this in the filter. For guidance on what spellings to use for filters, hover the cursor over the title above each field.

If you are adding multiple features, do not separate with any punctuation (as above). If the user has not defined these features of the lion in its primary profile when they created the lion, it will not be displayed in the search results.

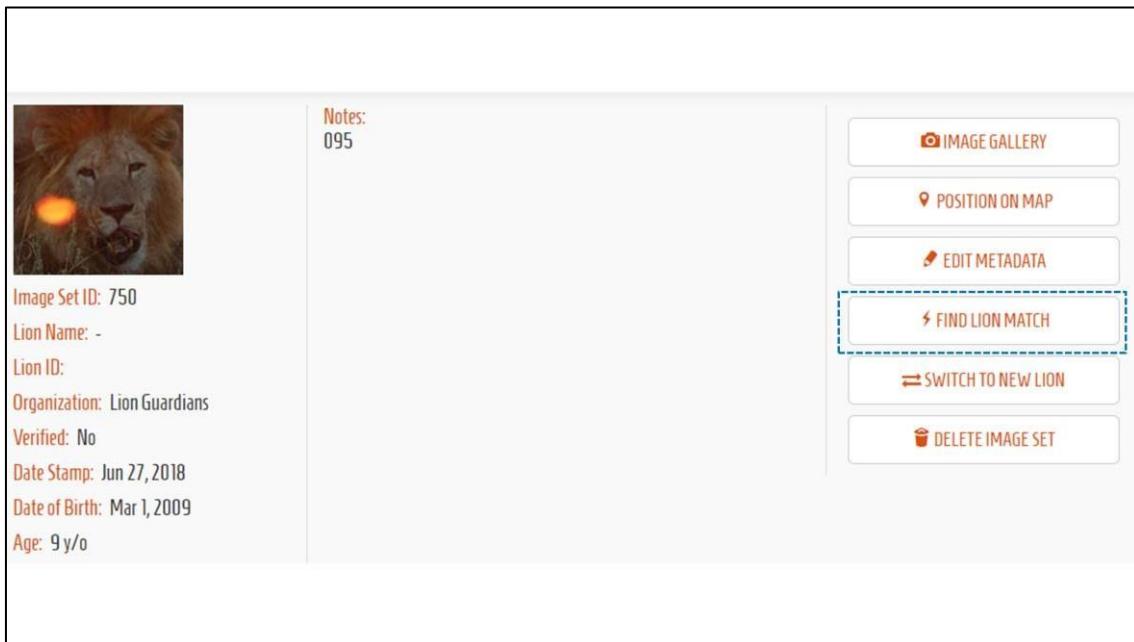
- Location-** returns lions that have been recorded within a specific radius of a given GPS point. Type the centre point of your search location (in Decimal degrees) and the radius distance (in km) around that which you want to search
- Geographical search-** this allows you to draw a polygon on a map and view all lions recorded within this specified area. Click the 'search area' button and on the top of the map select the shape you want to draw (polygon, circle or rectangle) and add this to the map over your area of interest. Once you have drawn the shape, select 'save search area' and save it as an appropriate name. The list of lions found in this area will be displayed on the left side of the map.

## Finding a match using the automated lion identification tool: Facial & whisker recognition

You can run the automated identification tool on photos of an unknown lion to help with identification. The LINC software uses computer vision (CV) and vector pattern recognition to compare and contrast facial features and whisker spot patterns of the unknown individuals against those of the lions in the LINC database.

Identify lions using the auto-ID tool:

- Open the newly created image set for the unknown lion, and click the **FIND LION MATCH** button.



- By default, this tool compares the unknown lion's photos against *all* lions in the database. If you can, it is best practice to reduce the number of comparisons the software needs to make by using the **Refine by** filter that comes up after you press the **Find Lion** button:
  - You can filter out the lions for comparison by entering filters such only males, only 4-12 years old, etc. (as explained on [pg. 38](#)). This will mean that the auto-ID tool will only run the comparisons against lions in the database that are males between 4-12 years of age. The fewer lions that the software has to compare against, the faster the analysis will run ([see pg. 38 on more details on filtering](#))

Note:

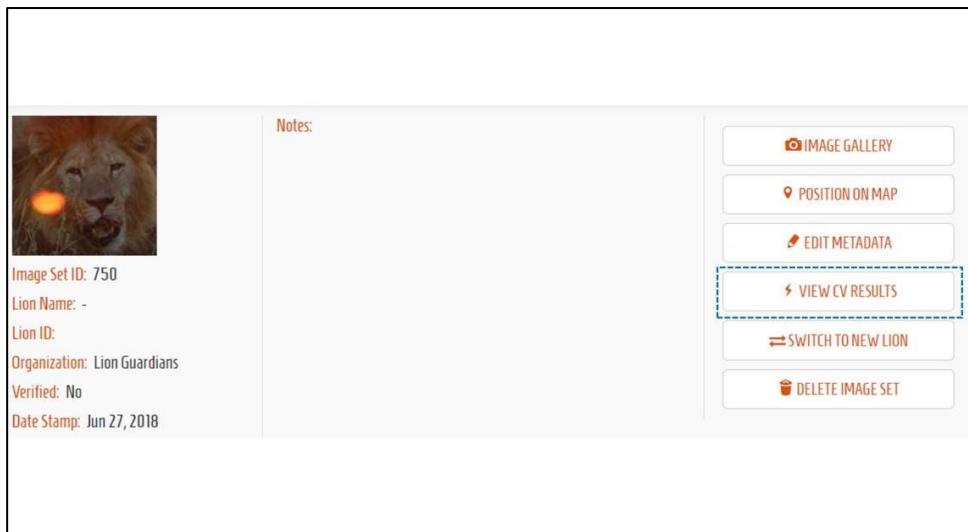
- Avoid entering **Features** into the filter when running the auto-ID tool. This is because features can vary over time; if you set the software to only search against lions with an ear notch in their left ear (as this is what the unknown lion now has), but this lion didn't previously have any ear notches when it was last photographed, this will prevent the algorithm from checking for a match with the correct lion.

- Click the **SELECT ALL** button at the top of the dialogue box (to choose to compare against all the filtered-out lions), or manually select each lion for comparison by clicking the rows of that individual in the display (a tick will be shown once it is selected). Lions without enough CV or whisker images will be greyed out and unable to be selected for the comparison. This is to ensure the algorithm isn't being compromised by low quality or quantity images.
- Then select what kind of automated ID test you want to run, either CV or whiskers or both. If there are no CV photos in the unknown lion's image set it will only give the option to run the auto-ID tool using the whisker analysis, and if there are not enough whisker photos it will only give the option to run a CV analysis.
- Finally, click the **FIND LION MATCH** button at the bottom left of the dialogue box.

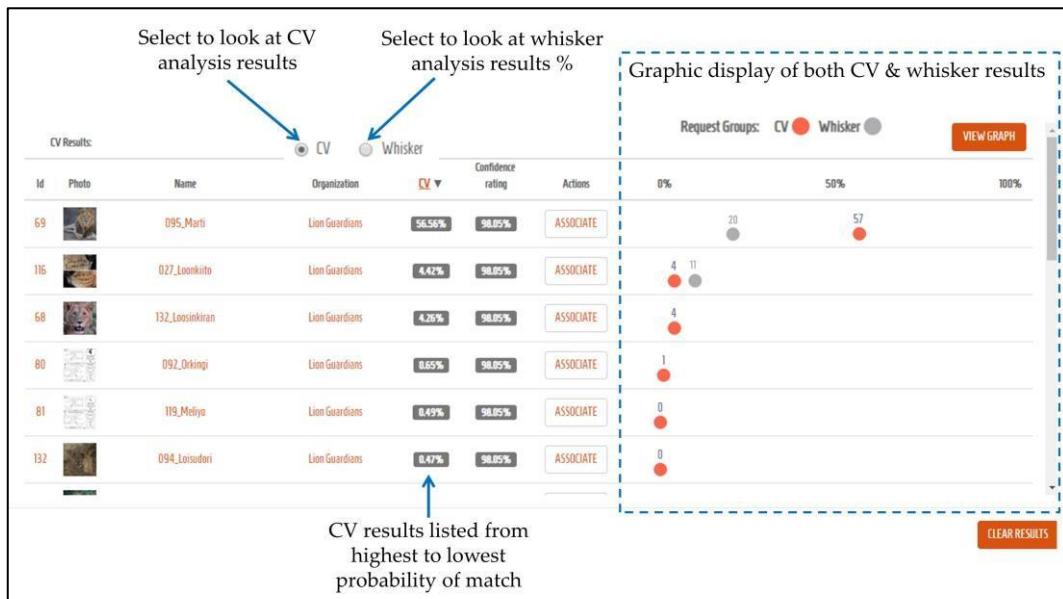
The screenshot shows the 'Find Lion Match' dialogue box. On the left, there are four sections with numbered callouts: 1. A gender filter with sliders for 0, 4, 12, and 32, and checkboxes for Male, Female, and Unknown. 2. A list titled '133 lions filtered' with a 'SELECT ALL' button. 3. A 'Classifier' section with checkboxes for CV and Whisker. 4. A large red 'FIND LION MATCH' button with the instruction 'Click button to run' below it. To the right of these sections is a table listing 133 lions, each with a thumbnail, ID, name, age, location, and gender. The table is as follows:

ID	Name	Age	Location	Gender
75	087_Losewan	10 y/o	131	Lion Guardians male
76	088_0DW male 1	10 y/o	132	Lion Guardians male
77	089_0DW male 2	10 y/o	133	Lion Guardians male
78	090_0DW male 3	10 y/o	134	Lion Guardians male
79	091_Lowuasa	9 y/o	135	Lion Guardians male
80	092_Dirkilingi	9 y/o	136	Lion Guardians male
131	093_Lenkiok	9 y/o	217	Lion Guardians male
132	094_Loisudori	9 y/o	218	Lion Guardians male
69	095_Marti	9 y/o	125	Lion Guardians male
133	099_Willy male cub B	9 y/o	219	Lion Guardians male

- The process will take 2-15 minutes, depending on the number of comparisons required. The button will change from **CV REQUEST PENDING** to **VIEW CV RESULTS** when the analysis is complete.
- Click **VIEW CV RESULTS** button to view the matches suggested by the auto-ID tool.



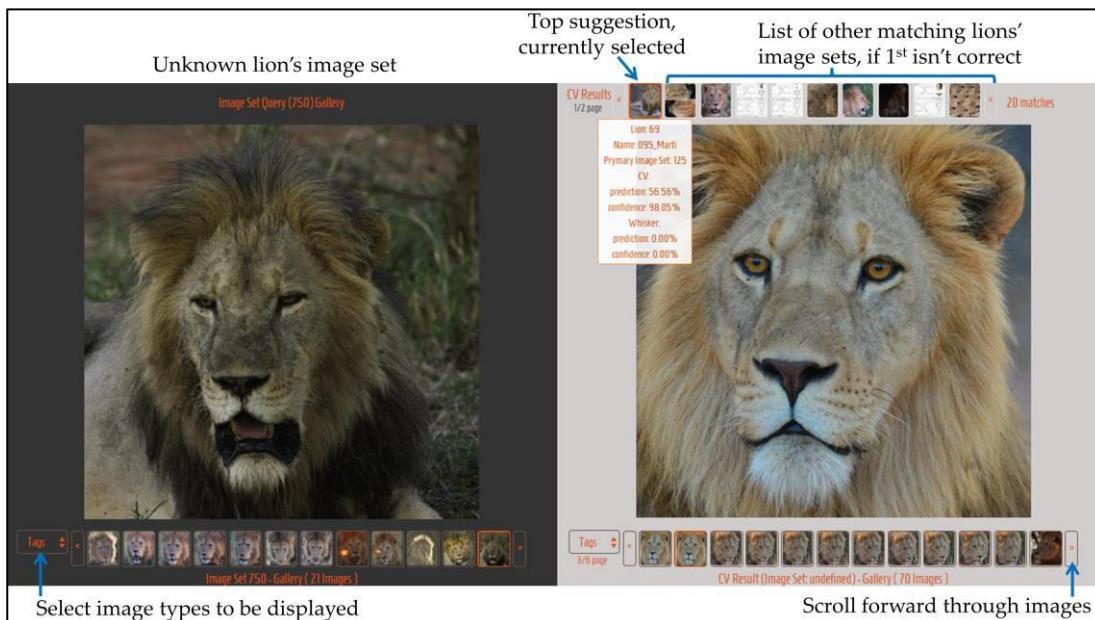
- The resulting suggestions for matching lions are listed in order of likelihood from highest to lowest for each type of test run (CV or Whiskers). To view results suggested by the CV algorithm, select the button labelled **CV**, to view the results suggested by whisker pattern analysis click the button labelled **WHISKER**. You can also sort by any other desired column in the list of lions by clicking on the title (it will be indicated by a downward or upward facing arrow on the right of the title name).



Note:

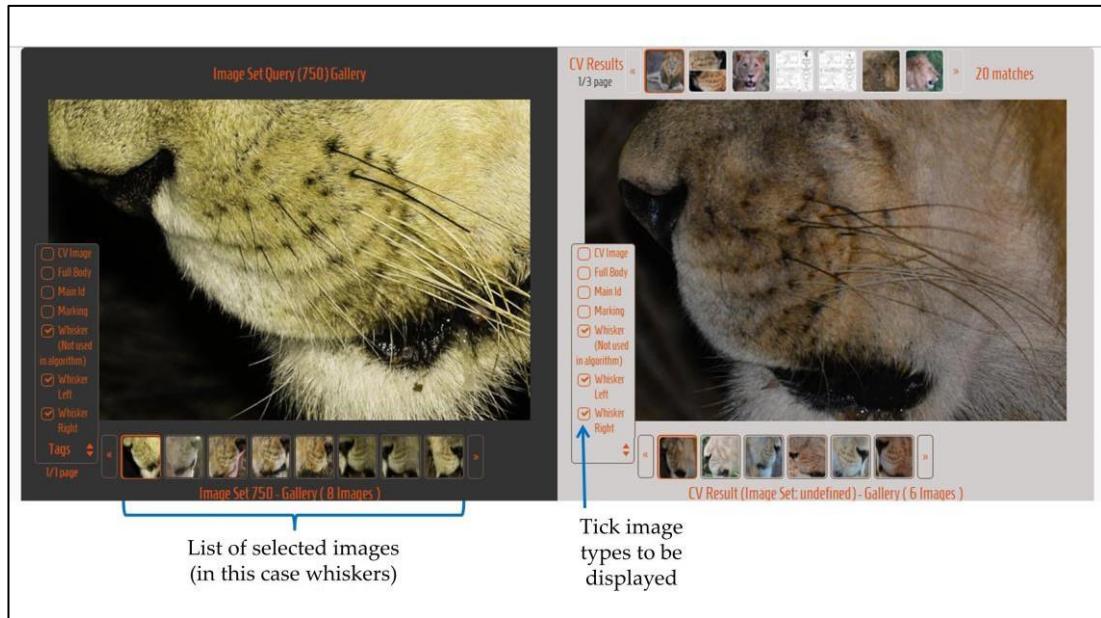
- The **CV%** indicates the confidence of the CV algorithm in predicting the right lion
- The **WHISKER%** indicates the confidence of the whisker pattern recognition algorithm in predicting the right lion
- The **CONFIDENCE RATING** indicates the likelihood of accuracy, based on the number of photos of each lion in the test, where more photos mean that the software is able to build a better classifier for comparisons between individuals.

- You will now need to **manually verify** the suggested matches given by the computer. To do this, you can compare and contrast the photos of the unknown lion against the suggested matching lion.
  - If you *right click* in the row of the suggested lion, LINC will open up a comparison window (make sure you have enabled pop-ups for this website).



Here, the unknown lion's image set is on the left and the image set for the suggested matching lion is on the right. All the other suggested lion's image sets are listed in a row on the top of the right-side image (listed from highest % match to lowest, left to right, or however you sorted the data). If you want to switch and check another lion from the suggestions, simply click on that picture/lion in the row on the top and then all their images will come up below.

- You can scroll through different photos of both the unknown and the suggested lions by clicking on the images in the rows at the bottom of the enlarged photos. You can also select to scroll through only a subset of image types by selecting **Type** and then selecting the image type which you want to view and compare. The easiest way to confirm a match is to compare whisker photos of the two, so start by only ticking the box for '**Whiskers**' under **Type** for both image sets:



- Once the lion has been accurately identified from the list of suggested matches, the relevant image set can be associated/linked with the identified individual's primary profile. To do this, you must close the comparison display box (above) and return to the list of CV results. Then under the column titled **Actions**, you click the **ASSOCIATE** button in the row of the matched lion.

CV Results:						Request Groups: CV	<b>VIEW GRAPH</b>		
Id	Photo	Name	Organization	CV	Confidence rating	Actions	0%	50%	100%
69		095.Marti	Lion Guardians		56.56%	<b>ASSOCIATE</b>		57	

CV Results:						Request Groups: CV	<b>VIEW GRAPH</b>		
Id	Photo	Name	Organization	CV	Confidence rating	Actions	0%	50%	100%
69		095.Marti	Lion Guardians		56.56%	<b>DISASSOCIATE</b>		57	

- The button will change to say **DISASSOCIATE** once the lion has been successfully associated.
- If you now go to the primary profile of this lion (by left clicking the name in the row), you will see the newly added image set (of the newly matched/Previously unknown lion) within the lion's profile (under **LION IMAGE SETS**). You can then make this new image set into the primary image set or join photos from this image set to the gallery of the primary image set.

Note:

Automated identification works by cross correlating test photos against all photos hosted on the LINC database; the software returns a confidence report based on this examination. **The more CV images a lion has (different angles, lighting) the more reliable the results will be. On the other hand, the software only needs 1 or 2 clear, side-on photos of the whiskers to make accurate suggestions.**

## What if my image set matches with another organization's lion?

Sometimes your image set might match a lion that is already in the database, but this lion's profile was created by another organization. This means that either your study area overlaps, or your lion has moved between study areas! It is important that you link/associate your matched image set with their lion. When you associate it ([as above](#)) this will send a notification to the "owner" of the lion's primary profile. From here, they will verify that it is indeed the same lion, before it is joined to "their" lion.

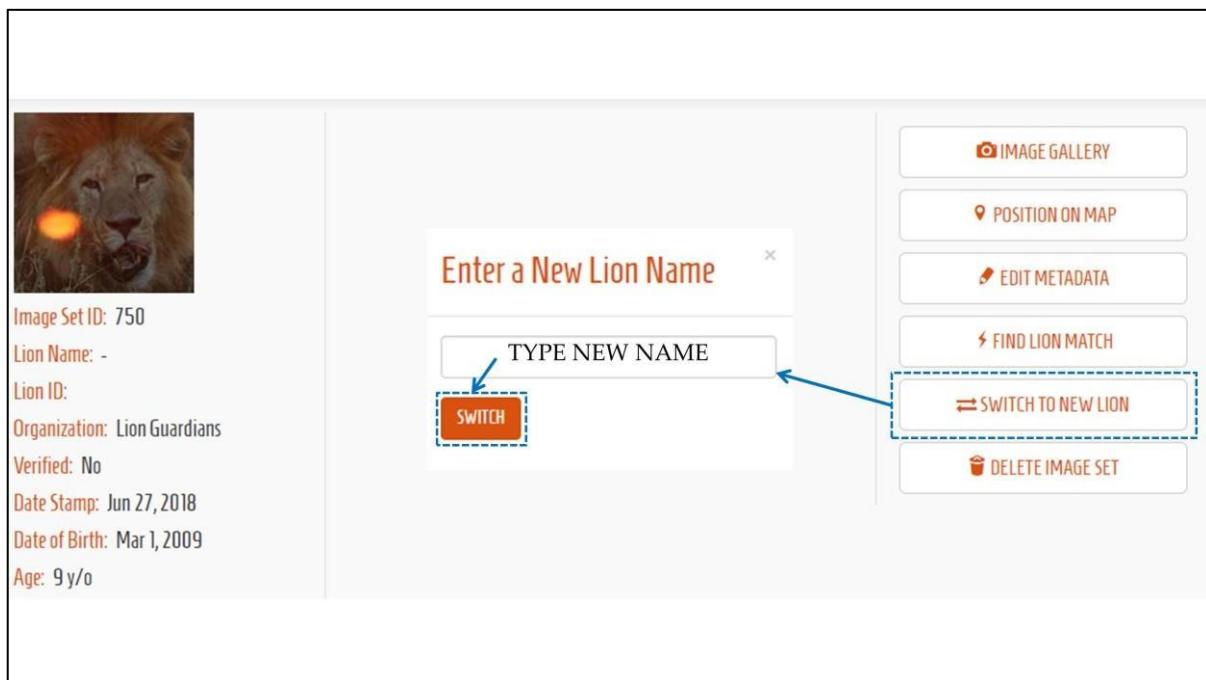
### Note:

- Associating your image with another organisations lion will allow them to access and edit this data (as well as you).

## What happens when there is no match?

If you have run an automated identification analysis and there is no matching lion for the image set in the database, this unknown individual is likely to be new to the system. You should therefore add it to LINC as a **new lion**:

- Simply go into the image set and click **SWITCH TO NEW LION** and enter your given name for the individual



## EXPORTING DATA FROM LINC

If you need to export data from your organization's database into excel format for analyses, you can do this by navigating to either the database of individuals or the database of all image sets, depending on what you are interested in.

If, for example, you want to export data on lion individuals from your organization that are aged between 3-12 years old:

- Click **VIEW LION DATABASE**
- Under **REFINE BY** use the **AGE** filter to show lions between 3-12
- Under **REFINE BY** press the **SELECT BATCH MODE** button and click **SELECT ALL**. If you would prefer to export specific individual's information from the list, select those manually from the rows.

155 lions found.												
Refine by												
Name or ID	Photo	Name	ImageSet Id	Age	Dead	Organization	Gender	Latitude	Longitude	GPS Points	Date Stamp	Verified
Organization		272_Nikasuku	783	4 y/o		Lion Guardians	female	-2.716794	37.280563	x	Jun 13, 2018	✓
		266_Nemeshenai	782	4 y/o		Lion Guardians	female	-2.726424	37.126789	x	Feb 5, 2016	✓
		265_Narkayarr	781	4 y/o		Lion Guardians	female	-2.726424	37.126789	x	Feb 5, 2016	✓
		261_Nenkuya	780	4 y/o		Lion Guardians	female	-2.642125	37.234215	x	May 20, 2018	✓
		259_Neti	779	4 y/o		Lion Guardians	female	-2.642125	37.234215	x	May 20, 2018	✓
		202_Ngosuani	778	5 y/o		Lion Guardians	female	-2.485573	37.317594	x	Feb 10, 2014	✓
		201_Nenkuzero	777	5 y/o		Lion Guardians	female	-2.485573	37.317594	x	Feb 10, 2014	✓
		163_Nempatipat	776	7 y/o		Lion Guardians	female	-2.339934	37.301015	x	Sep 10, 2013	✓
		149_Ntinyika	775	7 y/o		Lion Guardians	female	-2.343483	37.660889	x	Oct 30, 2013	✓
		102	774	9 y/o		Lion Guardians	female	-2.635314	37.271134	x	Oct 22, 2009	✓

**View Lion Database**

Refine by

155 lions found

Name or ID	<input checked="" type="checkbox"/> 414		202_Ngosuani	778	5 y/o	Lion Guardians	female	-2.485573	37.317594	x	Feb 10, 2014	✓
Organization	<input checked="" type="checkbox"/> 413		201_Nenkusero	777	5 y/o	Lion Guardians	female	-2.485573	37.317594	x	Feb 10, 2014	✓
Age	<input checked="" type="checkbox"/> 412		163_Nempatipat	776	7 y/o	Lion Guardians	female	-2.339934	37.301015	x	Sep 10, 2013	✓
Gender	<input checked="" type="checkbox"/> 411		149_Ntinyika	775	7 y/o	Lion Guardians	female	-2.343483	37.660889	x	Oct 30, 2013	✓
Features	<input checked="" type="checkbox"/> 410		102	774	9 y/o	Lion Guardians	female	-2.635314	37.271134	x	Oct 22, 2009	✓
Location	<input checked="" type="checkbox"/> 409		098_Willy Cub	773	9 y/o	Lion Guardians	female	-2.430096	37.302999	x	Sep 12, 2010	✓
Geographical	<input checked="" type="checkbox"/> 408		079_Tato Cub	772	10 y/o	Lion Guardians	female	-2.689282	37.162336	x	Feb 11, 2011	✓
	<input checked="" type="checkbox"/> 407		049_Nimaoi	771	12 y/o	Lion Guardians	female	-2.273838	37.686237	x	Oct 31, 2013	✓
	<input checked="" type="checkbox"/> 380		252_Nenyaruu	624	4 y/o	Lion Guardians	female	-2.726424	37.126789	✓	Feb 5, 2016	✓
	<input checked="" type="checkbox"/> 379		249_Newwas	623	4 y/o	Lion Guardians	female	-2.288697	37.187473	✓	Feb 1, 2018	✓
	<input checked="" type="checkbox"/> 378		246_Sunkuroi	622	4 y/o	Lion Guardians	female	-2.549744	37.384010	✓	Feb 25, 2018	✓

155 are selected

Tick/ untick individuals which to export data on

- Click **EXPORT** under the refine by filter. The data will then be downloaded in CSV format.

**LINC.** 

**DISABLE BATCH MODE**

Id	Photo	Lion Name	Lion Id	Age	Dead	Organization	Gender	Latitude	Longitude	Date Stamp
499		WCKM2	322	8 y/o		KWS-Nakuru National Park	male	-0.358140	36.119890	Sep 26, 2017
498		WCKM1	321	8 y/o		KWS-Nakuru National Park	male	-0.358140	36.119890	Sep 26, 2017
497		WCKF1	320	8 y/o		KWS-Nakuru National Park	female	-0.311500	36.119960	Sep 15, 2017
494		SQRF2	317	10 y/o		KWS-Nakuru National Park	female	-0.475410	36.113770	Oct 2, 2017
493		SQRF1	316	9 y/o		KWS-Nakuru National Park	female	-0.451360	36.096940	Sep 24, 2017
506		SQRbM2	329	1 y/o		KWS-Nakuru National Park	male	-0.451400	-0.451400	Sep 24, 2017
505		SQRbM1	328	1 y/o		KWS-Nakuru National Park	male	-0.451360	36.096940	Sep 24, 2017
504		SQRaM4	327	1 y/o		KWS-Nakuru National Park	male	-0.475400	36.113800	Oct 2, 2017
503		SQRaM3	326	1 y/o		KWS-Nakuru National Park	male	-0.475400	36.113800	Oct 2, 2017
502		SQRaM2	325	1 y/o		KWS-Nakuru National Park	male	-0.475400	36.113770	Oct 2, 2017

Data-Lions-2018-6....csv ^ Once downloaded, navigate to downloads and open .csv file

- Once finished with exporting, press **DISABLE BATCH MODE** to return to normal view for LINC.



Id	Photo	Lion Name	Lion Id	Age	Dead	Organization	Gender	Latitude	Longitude	Date Stamp
<input checked="" type="checkbox"/> 499		WCKM2	322	8 y/o		KWS-Nakuru National Park	male	-0.358140	36.119890	Sep 26, 2017
<input checked="" type="checkbox"/> 498		WCKM1	321	8 y/o		KWS-Nakuru National Park	male	-0.358140	36.119890	Sep 26, 2017
<input checked="" type="checkbox"/> 497		WCKF1	320	8 y/o		KWS-Nakuru National Park	female	-0.311500	36.119960	Sep 15, 2017
<input checked="" type="checkbox"/> 494		SQRF2	317	10 y/o		KWS-Nakuru National Park	female	-0.475410	36.113770	Oct 2, 2017
<input checked="" type="checkbox"/> 493		SQRF1	316	9 y/o		KWS-Nakuru National Park	female	-0.451360	36.096940	Sep 24, 2017
<input checked="" type="checkbox"/> 505		SQRbM2	329	1y/o		KWS-Nakuru National Park	male	-0.451400	-0.451400	Sep 24, 2017
<input checked="" type="checkbox"/> 505		SQRbM1	328	1y/o		KWS-Nakuru National Park	male	-0.451360	36.096940	Sep 24, 2017
<input checked="" type="checkbox"/> 504		SQRaM4	327	1y/o		KWS-Nakuru National Park	male	-0.475400	36.113800	Oct 2, 2017
<input checked="" type="checkbox"/> 503		SQRaM3	326	1y/o		KWS-Nakuru National Park	male	-0.475400	36.113800	Oct 2, 2017
<input checked="" type="checkbox"/> 502		SQRaM2	325	1y/o		KWS-Nakuru National Park	male	-0.475400	36.113770	Oct 2, 2017

## FAQs

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**What are the computer requirements for this software?** - LINC is an online platform and therefore should be compatible across all computer systems. All it requires is a username, password, and internet access. Once the user is set up on LINC, they can log into the program from any computer.

**How big should the uploaded photos be?** - it is up to the user whether they want to upload a high-resolution photo (meaning it will be stored and available for download in this quality at a later stage). However, the bigger the photo the more time it takes to upload.

**Can I upload photos of cubs?** Yes, you can upload photos of cubs, but CV photos should only be added when the lion is over 2 years old. However, the software is able to use whisker photos of lions from all ages.

**Can I upload data on other cats/species?** - No. This is purely for lion data at the moment.

**LINC uses a MongoDB software system-** There data are stored on 3 different servers. The software is storing all this info in a non-relational database. Each data point is stored in a different page. All the information is available for download in a CSV format.