



(Lion Identification Network of Collaborators)

USER MANUAL

2018

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WHAT IS LINC?

- 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

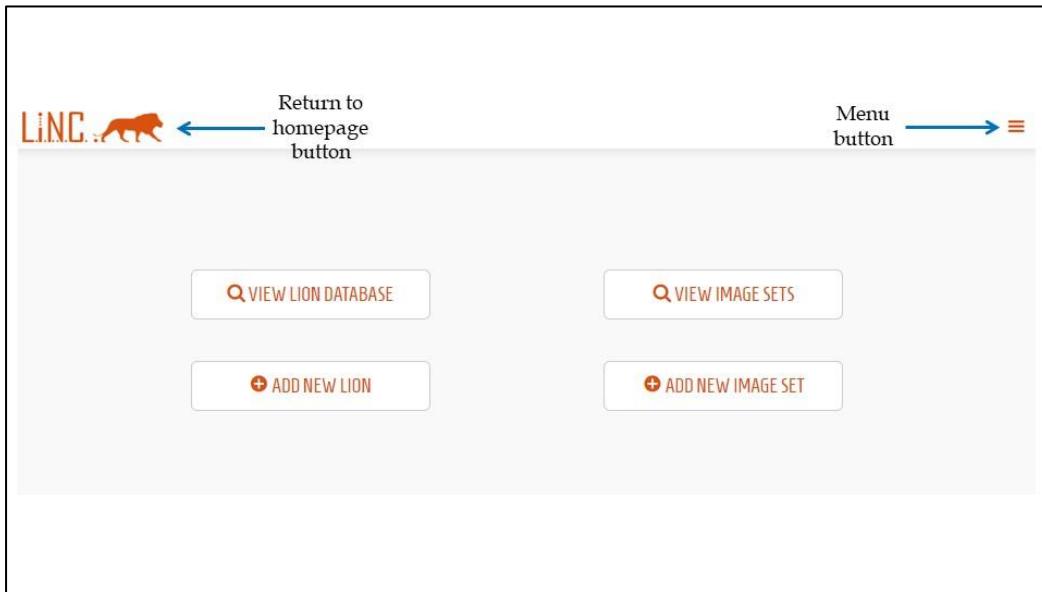
photo and GPS points can also be set as private, to respect the privacy and copyright that conservationists hold on their data.

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

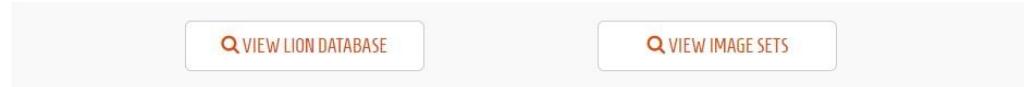
Navigating the homepage

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



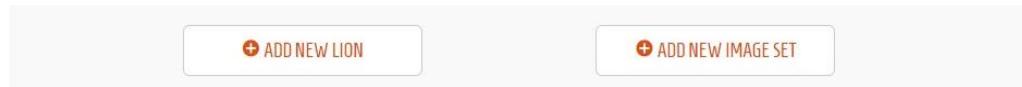
The LINC logo button is always visible in the top left corner of all pages and when pressed, it will return you to the homepage. Through the menu button at the top right corner of the page, you can access the admin aspects of LINC (changing passwords, looking up email addresses of other LINC users, accessing 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 (see [pg. 6](#) for more info).
- **VIEW IMAGE SETS** opens up a list of all the data on additional observations of each of these lions, known as *image sets* (see [pg. 11](#) for more info).

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

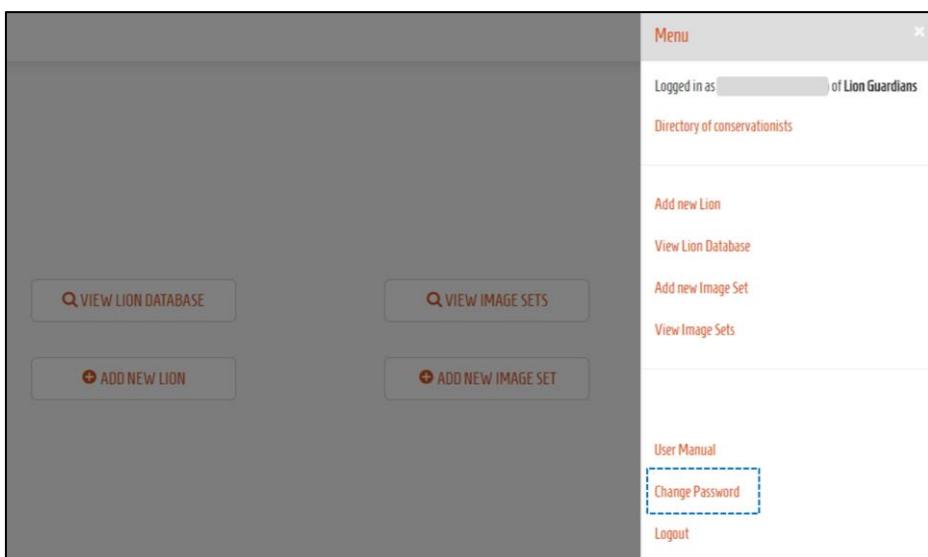
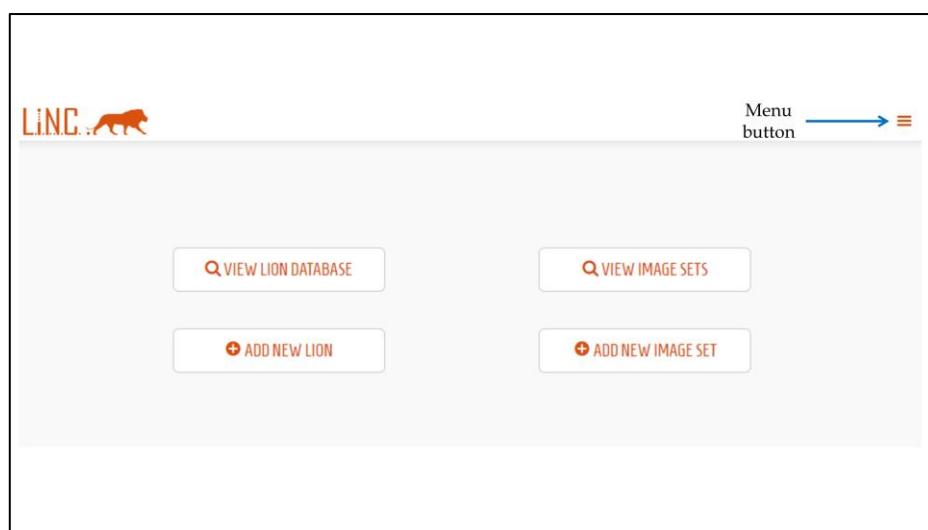


LINC stores these data online and you can access and update them at any time:

- **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.).

Resetting your password

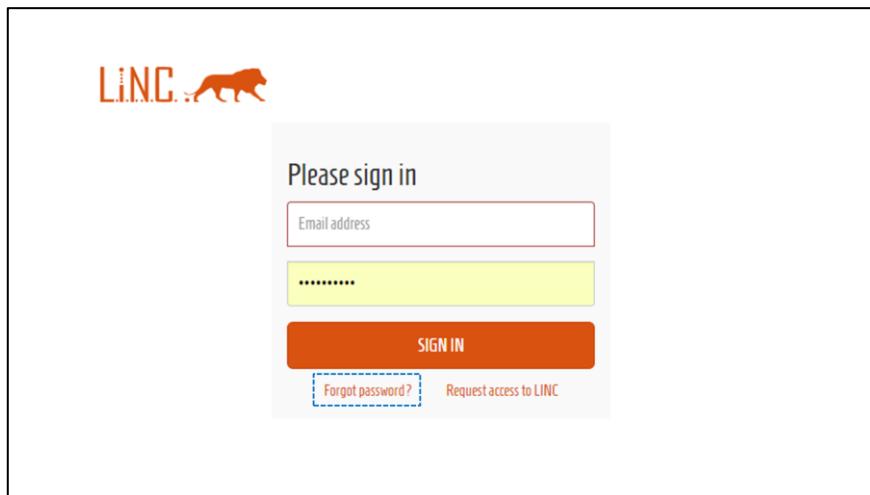
Once you have logged in, you may want to reset your password to one of your own choosing:
Select the menu button on the homepage, then press **Change password**.



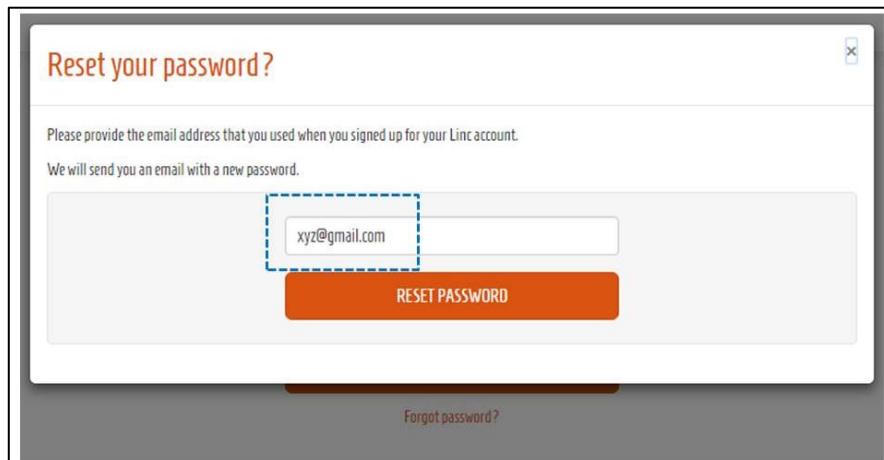
Enter and confirm this new password, then click **Change password** when done. This is now your new password to log into LINC.

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.

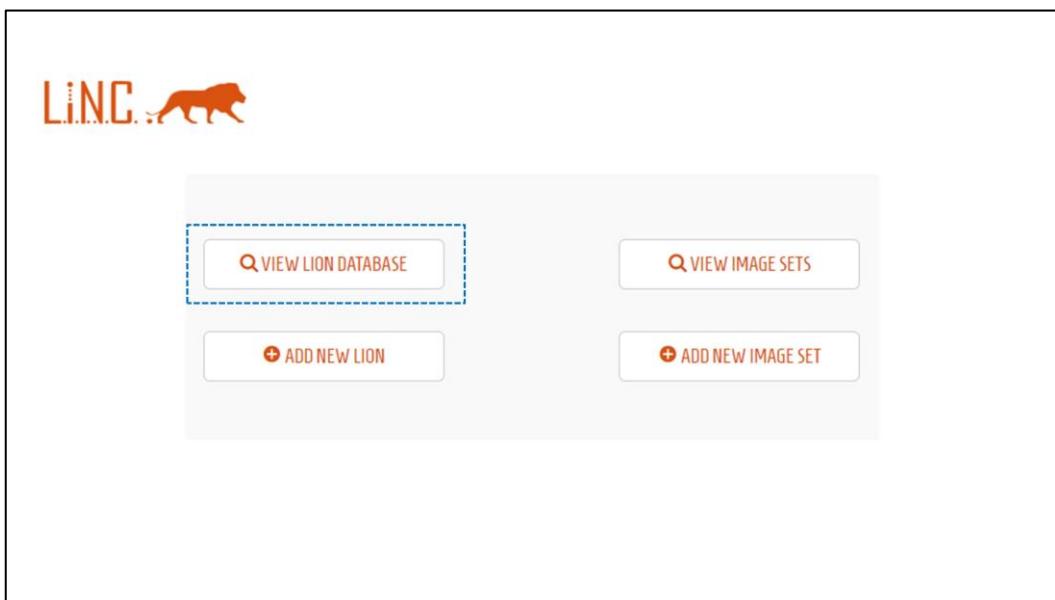


This will send your new password to the given email addresses and you can then log in with this password. Remember to then change this auto-generated password to one of your choosing by following the steps above (see [pg. 5](#)).

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).

Select which data columns are shown by clicking the relevant titles

COLUMNS TO SHOW	
<input type="checkbox"/>	SELECT ALL
<input type="checkbox"/>	SELECT NONE
<input checked="" type="checkbox"/>	Age
<input checked="" type="checkbox"/>	Date of Birth
<input checked="" type="checkbox"/>	Dead
<input checked="" type="checkbox"/>	Organization
<input checked="" type="checkbox"/>	Gender
<input type="checkbox"/>	Latitude
<input type="checkbox"/>	Longitude
<input checked="" type="checkbox"/>	Location Tag
<input type="checkbox"/>	GPS Points Private
<input type="checkbox"/>	Tag Features
<input type="checkbox"/>	Notes
<input checked="" type="checkbox"/>	Time Stamp
<input type="checkbox"/>	Verified

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. 38](#) for more details on how to search using filters).

Id	Photo	Name	Imageset Id	Age	Dead	Organization	Gender	Latitude	Longitude	Date Stamp
333		007_Charly	576	16 y/o		Lion Guardians	female	-2381597	37.675707	Mar 27, 2007
310		012_Birdie NApe	474	16 y/o		Lion Guardians	female	-2.792841	37.807786	Mar 26, 2012
122		016_Manywale	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_Singila	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_Loontirto	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_Shaka	177	12 y/o		Lion Guardians	male	-2.792840	37.807777	Mar 31 2016

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

ID	Lion	Relation
40	189_Loolaimadik	Associate
99	111_Meschi	Mother
377	245_Nawashie	Sibling

Cover photo
Lion's meta-data
Notes:
Relatives:
List of relatives & associates
Photos of lion
GPS points for lion observation
Edit data
Additional observations of this lion
Delete this lion from LINC database

Each lion's primary profile includes:

- The lion's cover photo - your favorite 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
- A set of photographs of this lion in the image gallery, 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 (see [pg. 11](#))
- 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.

The screenshot shows the 'Lion Info' page for a lion named 246_Sunkuroi. On the left, there is a large thumbnail image of the lion's face. Below the image are several metadata fields: Lion Name: 246_Sunkuroi, Lion ID: 378, Primary Image Set ID: 622, Organization: Lion Guardians, Verified: Yes, Date Stamp: Feb 25, 2018, and Date of Birth: Nov 1, 2013. To the right of the image is a table titled 'Relatives' with three rows of data:

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

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

- IMAGE GALLERY** (highlighted with a dashed blue border)
- 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. 19](#) 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**).

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

Filter to sort photos by name, date or image type

Select image type to get a subset of the images

Select images with specific properties

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).

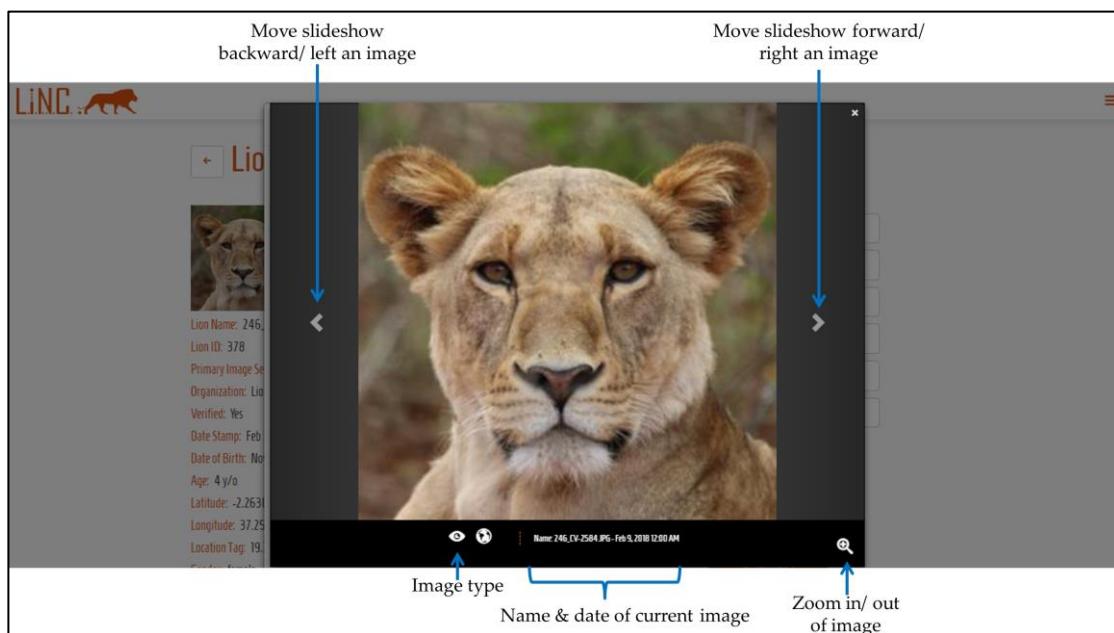
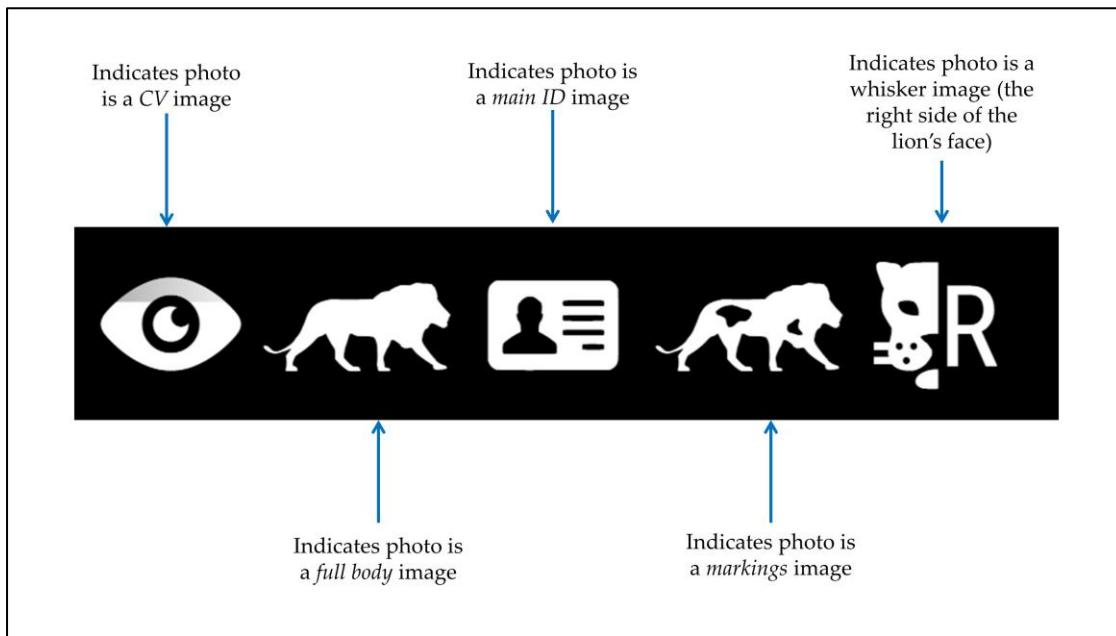
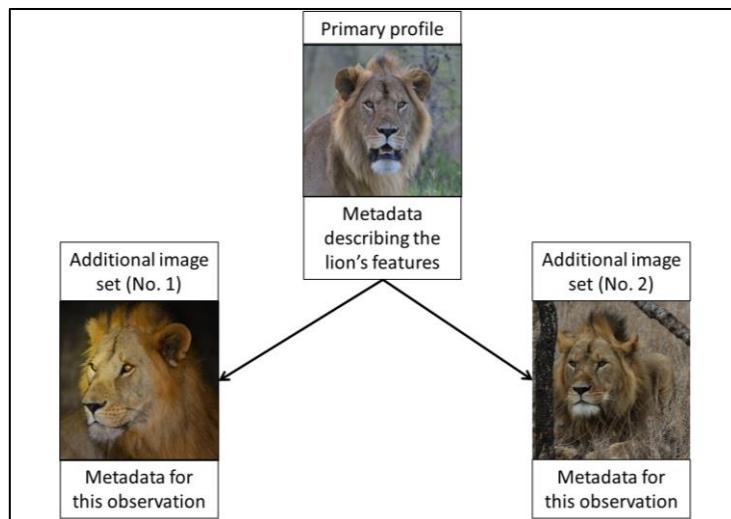


Image type tags are indicated below each photo:



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.





Lion Name: 095_Marti

Lion ID: 69

Primary Image Set ID: 125

Organization: Lion Guardians

Verified: Yes

Date Stamp: Mar 17, 2016

Date of Birth: Feb 2, 2009

Age: 9 y/o

Latitude: -2.3050

Longitude: 37.0791

Gender: male

Notes:		
Has eye-spot in right eye. Slight nick out of right ear, low at C/D position; two slices in left ear at top of C and bottom of C position.		
Relatives:		
Id ▲	Lion	Relation
171	313	Cub
172	314_Koyombo	Cub
173	315_Maplet (Meshi 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

[IMAGE GALLERY](#)

[POSITION ON MAP](#)

[EDIT METADATA](#)

[RELATIVES](#)

[LION IMAGE SETS](#)

[DELETE LION](#)

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

Additional image set

Id	Photo	Lion Name ▲	Lion Id	Age	Dead	Organization	Gender	Latitude	Longitude	GPS Points		Time Stamp	Features	Verified	Primary	Actions
										Private	Public					
125		095_Marti	69	8 y/o		Lion Guardians	male	-2.304953	37.079095	✓		2016-03-17	ⓘ	✓	✓	DISASSOCIATE
331		095_Marti	69			Lion Guardians	male	-2.362550	37.323029	✓		2016-11-10	ⓘ	✓	✗	DISASSOCIATE SET PRIMARY

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.

To see the details for each of these additional image sets, click on the relevant row. This will allow you to look at the metadata or look through the photos in that particular image set in the same way as you would do for a primary profile/image set (see pg. 9). Remember that the details in this additional image set are specific to this one observation.

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



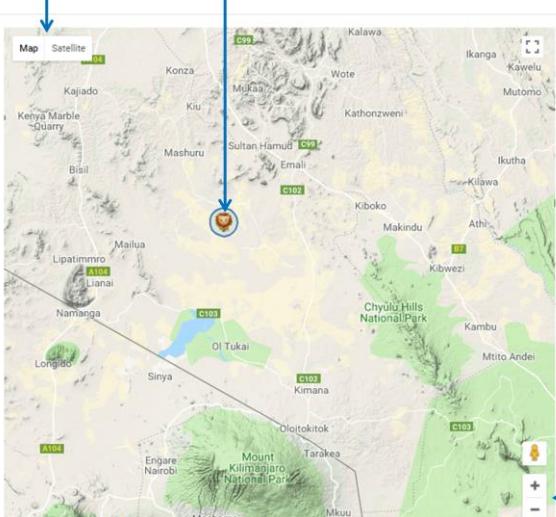
Lion Name: 246_Sunkuroi
Lion ID: 378
Primary Image Set ID: 622
Organization: Lion Guardians
Verified: Yes
Date Stamp: Feb 25, 2018
Date of Birth: Nov 1, 2013

Id	Lion	Relation
40	189_Loolaimutiak	Associate
99	111_Moshi	Mother
377	245_Nawishie	Sibling

Notes:
Relatives:

IMAGE GALLERY
POSITION ON MAP (highlighted with a dashed blue box)
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](#)).



Date & image set from which GPS point is taken → **IMAGE SET 622 - 2018-02-25**

Location History

Will display the general area name/ location

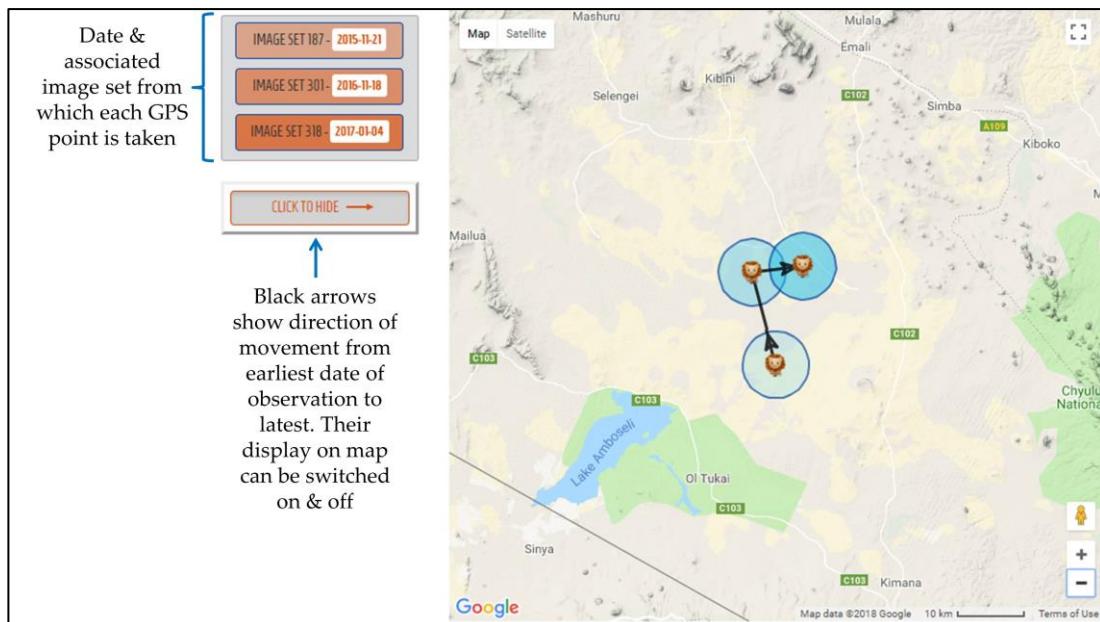
Switch between street/ satellite base map

Pin to show lion's position

Zoom in/out of map

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 21st November 2015) and 2 additional image sets (on 18th November 2016 & 4th Jan 2017) and it has moved a short distance between each of these observations:



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.

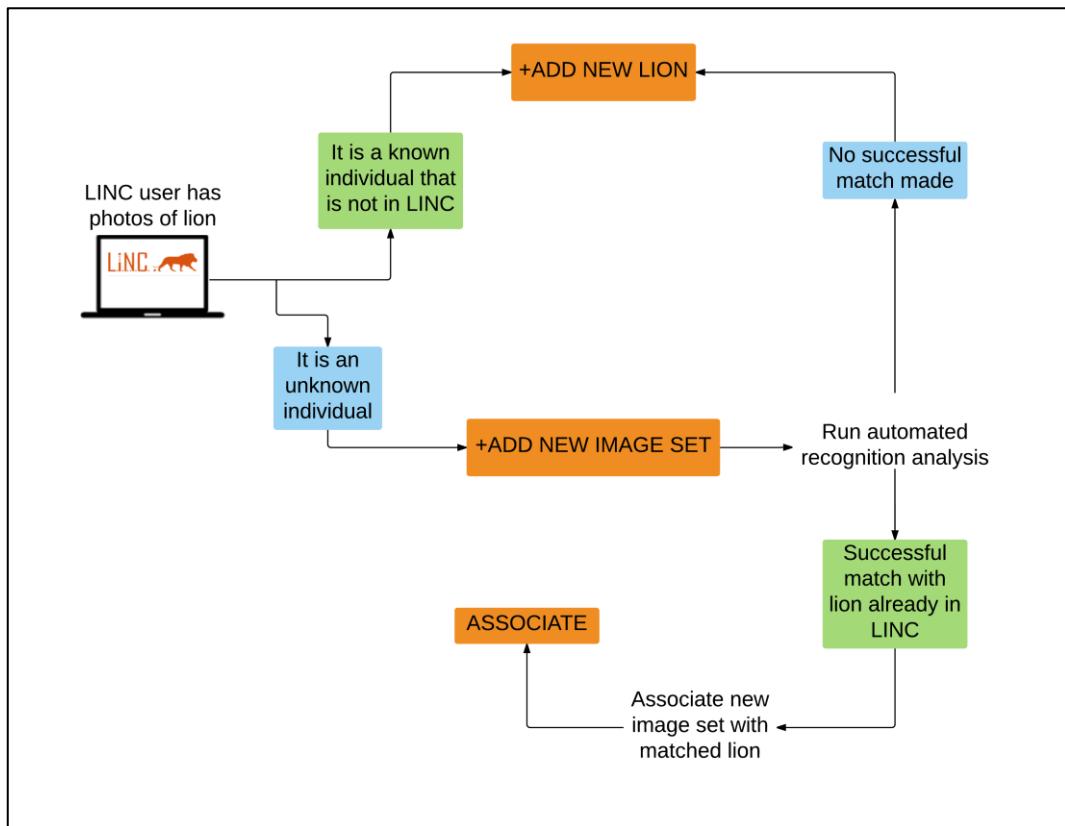
ADDING TO THE LION DATABASE - SUGGESTED WORK FLOW

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 work flow:

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](#).
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.

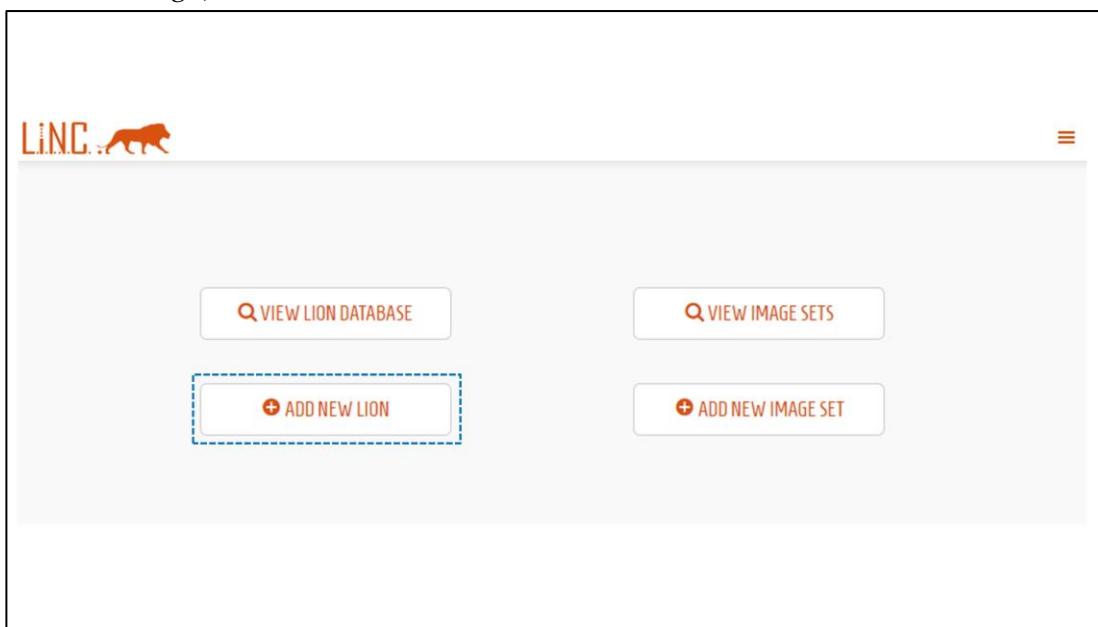
See below for details on how to work through these steps.



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**:

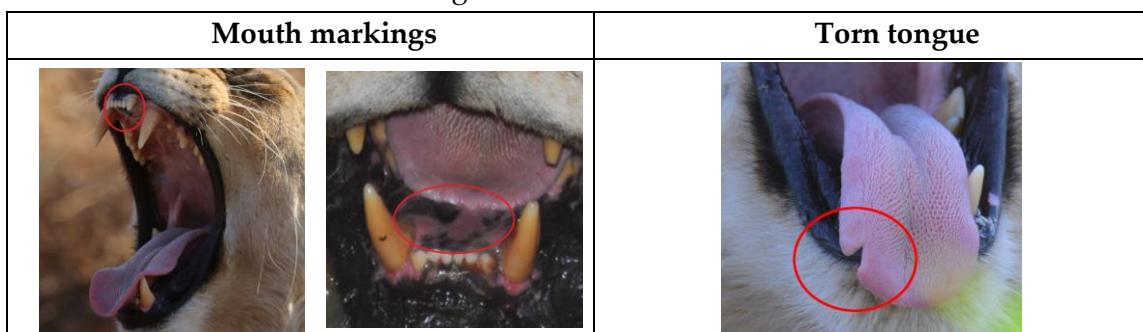


Fill in the appropriate metadata for this lion in the dialogue box, where possible:

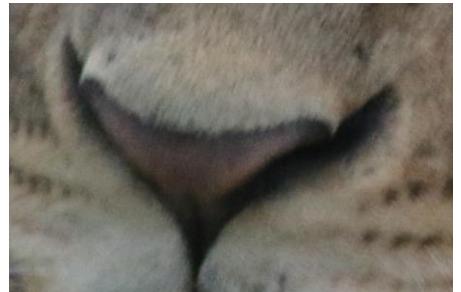
The form includes fields for organization, lion name, date stamp, birth date, age, gender, markings, and location. Annotations explain the purpose of each field:

- Name of organization to whom the photos belong**: Organization
- Lion's given name**: Lion Name
- Date lion was born**: Date of Birth
- Date photos of lion were taken**: Date Stamp (Jul 5, 2018)
- GPS coordinates (DD-0.0000°) where lion was seen**: Latitude and Longitude
- Location Tag**: Select On Map
- Sex of lion**: Gender
- Ear Markings**, **Mouth Markings**, **Tail Markings / Missing Tuft**, **Nose Color**, **Eye Damage / Pigmentation**, **Scars**: Various dropdown options for marking types.
- Markings & features of the lion to enable easier identification**: A bracket covering the marking dropdowns.
- Name & location of rough home range**: Notes here (text area).
- Any additional notes/ details about lion that aren't covered in the above options**: Notes here (text area).
- GPS points and Location on map are Private**: A checkbox.
- Dead Lion**: A checkbox.
- Box checked if user wants the GPS points only to be visible to users within the same organization**: An arrow points from the 'Private' checkbox to this note.
- CREATE** and **CREATE & ADD IMAGES** buttons at the bottom.

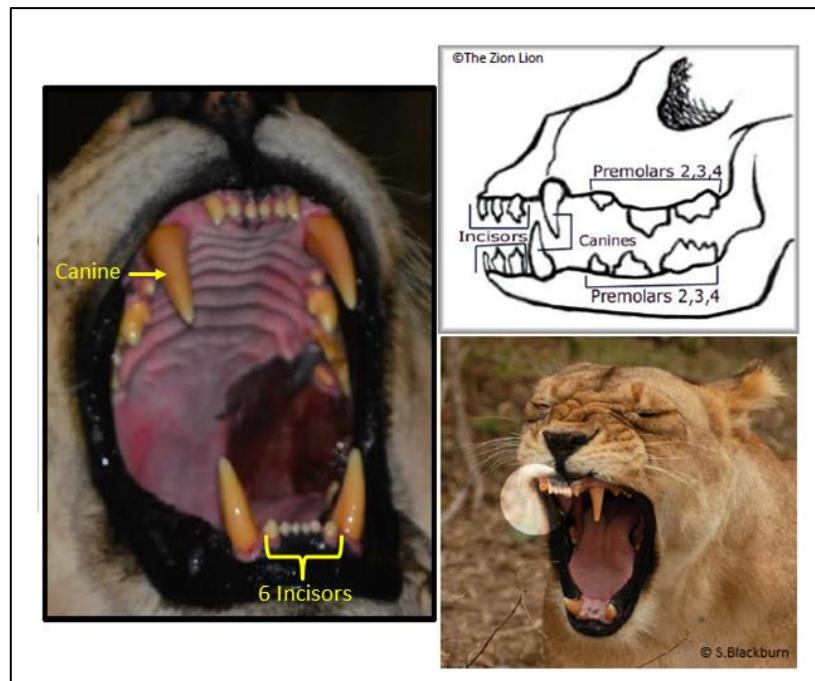
- **Organization**: The name of your organization (the owner of the data and photographs).
- **Lion Name**: The name and/or code of the lion (if given by your organization).
- **Date Stamp**: The date on which the lion was last observed. In the primary image set you may set this as the date of the most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



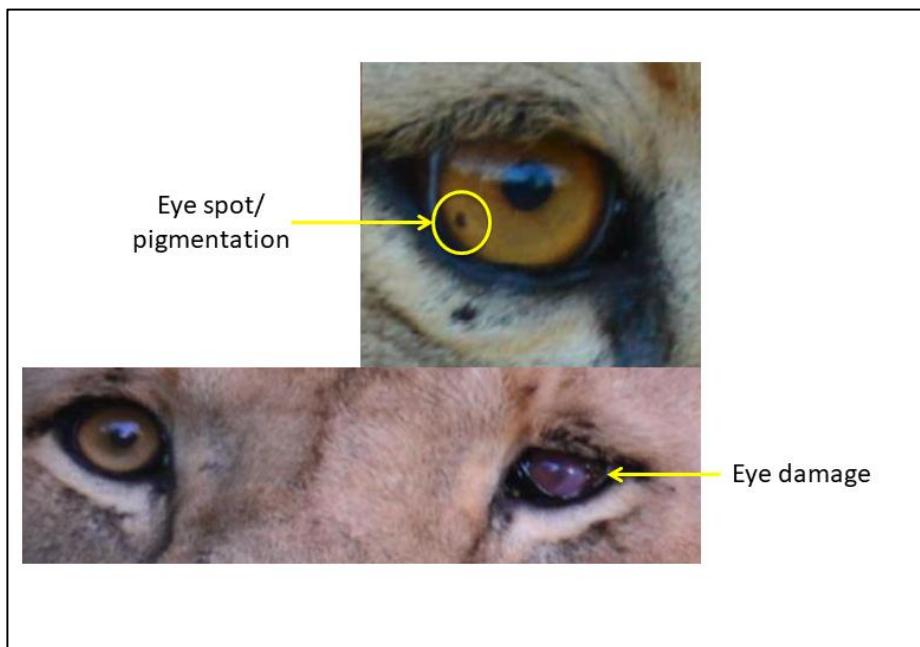
- **Nose colour:** Note whether the lion has a 'black' 'patchy', 'spotted' or 'pink' nose.

Black	Patchy
	
Spotted	Pink
	

- **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: Date of Birth	Mouth Markings: UNKNOWN	Tail Markings / Missing Tuft: UNKNOWN
Latitude: Latitude	Age (years) Age	Nose Color: UNKNOWN	Eye Damage / Pigmentation: UNKNOWN
Longitude: Longitude	Gender: UNKNOWN	Scars: UNKNOWN	
Location Tag: Select On Map			
Notes here		<input type="checkbox"/> GPS points and Location on map are Private <input type="checkbox"/> Dead Lion	
		CREATE	CREATE & ADD IMAGES

If you want to create and add images, 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. 19](#) for details) and decide whether the photo is to be set as '[public](#)' or '[private](#)'.

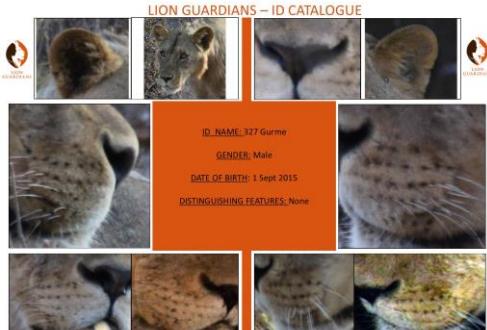
Notes on photographs:

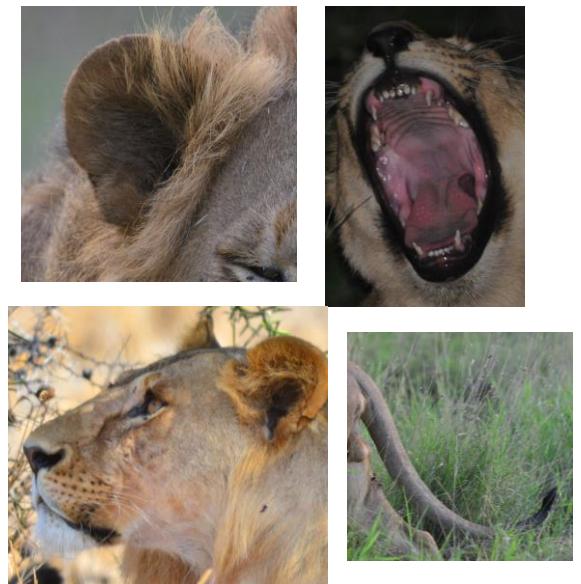
- Remember you need to pre-crop the photographs of the lion, with a photo editing software, BEFORE you upload them to LINC. The photos will need to be cropped as shown in the [table below](#).
- The images must be JPG format.
- Smaller sized photos will upload quicker- it is recommended that each photo 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.

Explanation of image types/crops required:

Image type	Description	Example
CV photo	This is normally a portrait photo of the lion from the chin-tip of ear. The lion must be looking forwards. The photo must be cropped in a square (1x1 aspect ratio). The automated lion recognition tool works better the more CV photos there are, so try to get as many as possible. Do not include CV photos of lions less than 2 years old.¹	
Full body	The entire lion (preferably one of the left and one of the right side).	

¹ 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

Image type	Description	Example
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). These photos should be public.</p>	
Whiskers	These photos will show a close up of the whisker spots on the lions left or right side.	
Left & Right	<p>The photos for this image type are those that are completely horizontal/side-on (not angled). Try to get 2 clear photos on each side.</p>	
Whiskers (not for algorithm)	<p>Because the automated whisker ID algorithm requires sharp, side-on photos (described above) there is a separate category for photos of whiskers taken at an angle. These will help users to manually ID the lion, but would confuse the computer's algorithm so mark them in this category.</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. There should be around 2-4 photos of each type of marking where possible.</p>	 



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

- 1) Start by adding all your CV images. Select **CV IMAGE** from the drop-down list of **Tags**.
- 2) 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.

Select files3. DRAG & DROP IMAGES HERE OR CLICK TO SELECT

Upload queue

Queue length: 0
Tags:

1. Select Image Tags...

2. Properties: PUBLIC

		Cover Image	Size	Progress	Status	Actions
Image	Name					
		Main Id				
		Whisker Left				
		Whisker Right				
		Marking				
		Whisker (Not used in algorithm)				
		Full Body				

4. UPLOAD IMAGES

- 3) 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.
 - 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

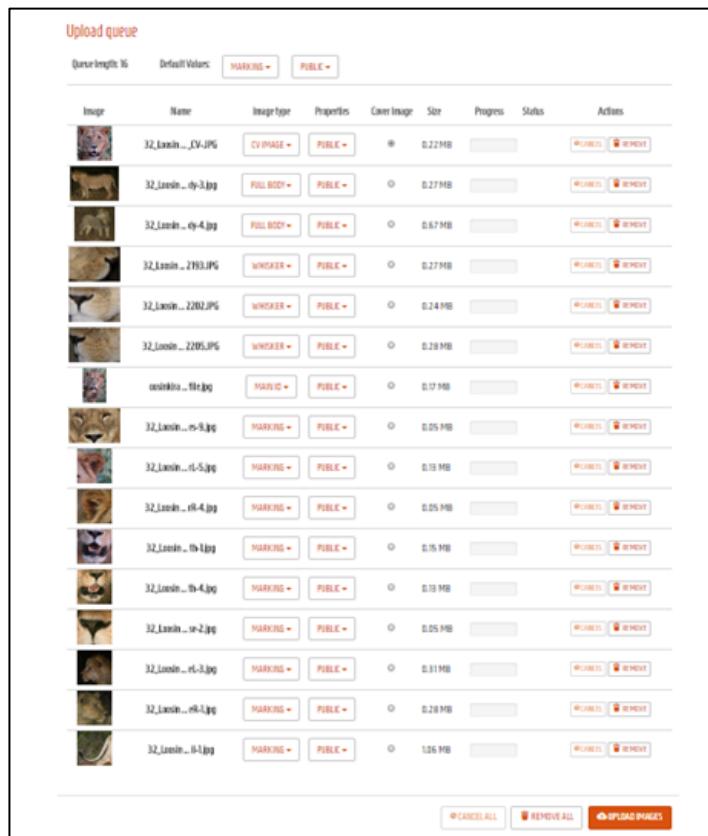
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steps for all the different image types that you cropped (*CV*, *Full body*, *Whiskers Left/Right/not for algorithm*, *Main ID* and *Markings*)

- Once you have selected and tagged all your photos, you will see them in a list:

Note

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.



- From this list, you can change any settings for individual photos (remove it, change the tags or change it from private/public) if necessary.

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="radio"/>	0.22 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... dy-3.jpg	FULL BODY	PUBLIC	<input type="radio"/>	0.27 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... dy-4.jpg	FULL BODY	PUBLIC	<input type="radio"/>	0.67 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... 2193.JPG	WHISKER	PUBLIC	<input type="radio"/>	0.27 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... 2202.JPG	WHISKER	PUBLIC	<input type="radio"/>	0.24 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... 2205.JPG	WHISKER	PUBLIC	<input type="radio"/>	0.28 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	oosinkira ... file.jpg	MAIN ID	PUBLIC	<input type="radio"/>	0.17 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... es-9.jpg	MARKING	PUBLIC	<input type="radio"/>	0.05 MB	<div style="width: 10%;">10%</div>	QUEUED	<button>CANCEL</button> <button>REMOVE</button>

Preview of each photo

Click to remove from upload queue

- 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**.

- 4) 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.

	32_Loosin ... th-1.jpg	MARKING	PUBLIC	<input type="radio"/>	0.15 MB	<div style="width: 10%;">10%</div>	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... th-4.jpg	MARKING	PUBLIC	<input type="radio"/>	0.13 MB	<div style="width: 10%;">10%</div>	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... se-2.jpg	MARKING	PUBLIC	<input type="radio"/>	0.05 MB	<div style="width: 10%;">10%</div>	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... el-3.jpg	MARKING	PUBLIC	<input type="radio"/>	0.31 MB	<div style="width: 10%;">10%</div>	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... eR-1.jpg	MARKING	PUBLIC	<input type="radio"/>	0.28 MB	<div style="width: 10%;">10%</div>	<button>CANCEL</button> <button>REMOVE</button>
	32_Loosin ... il-1.jpg	MARKING	PUBLIC	<input type="radio"/>	1.06 MB	<div style="width: 10%;">10%</div>	<button>CANCEL</button> <button>REMOVE</button>

CANCEL ALL REMOVE ALL **UPLOAD IMAGES**

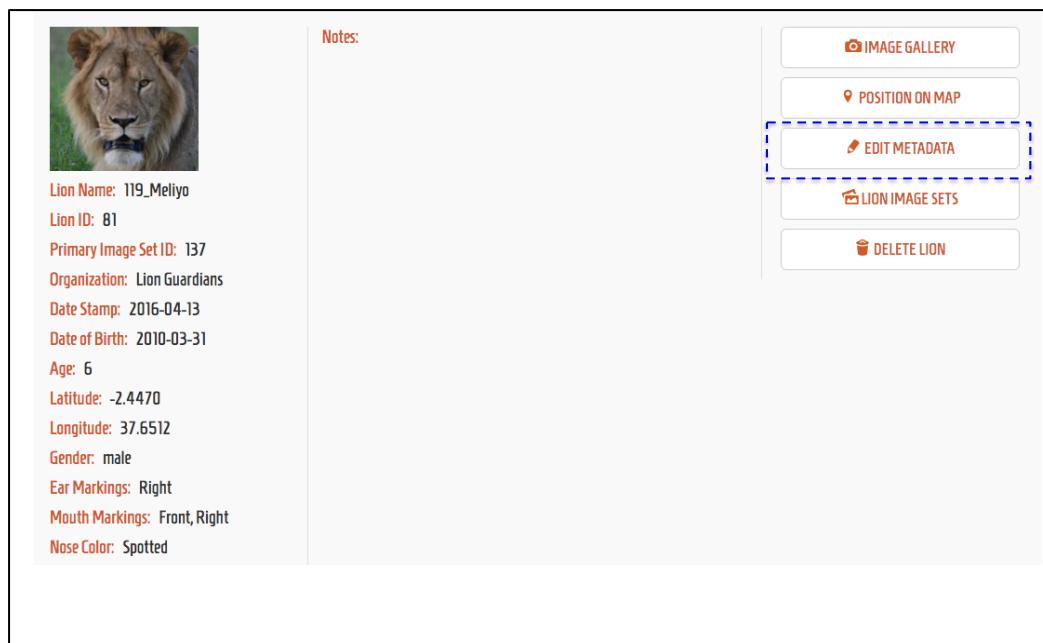
After the upload is completed, the lion's new profile page will open automatically.

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**.

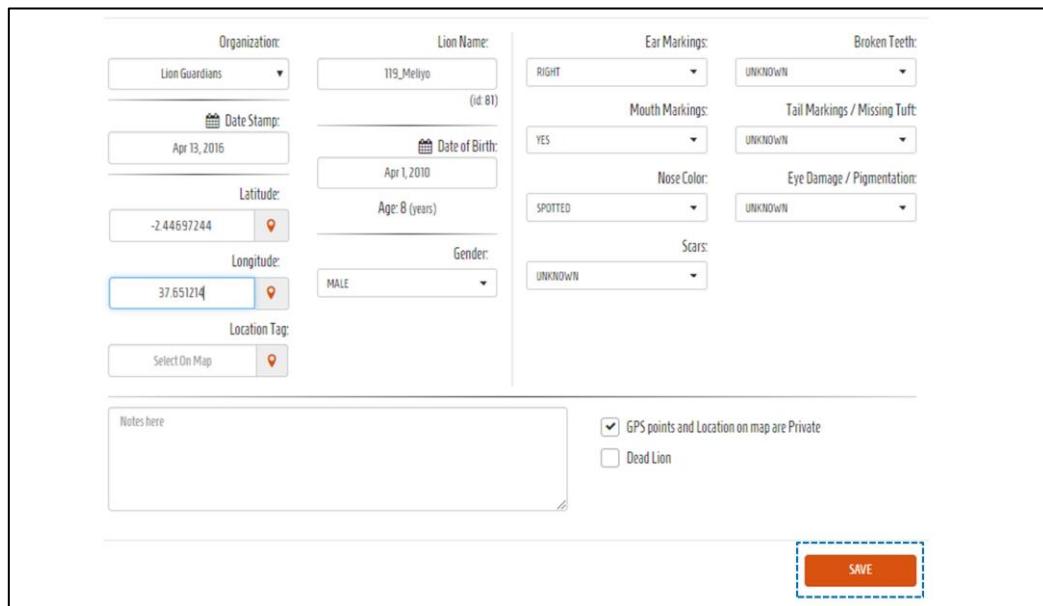


The screenshot shows the primary profile page for a lion named '119_Meliyo'. On the left, there is a cover image of a lion's face. Below it, a table lists the following metadata:

Lion Name:	119_Meliyo
Lion ID:	81
Primary Image Set ID:	137
Organization:	Lion Guardians
Date Stamp:	2016-04-13
Date of Birth:	2010-03-31
Age:	6
Latitude:	-2.4470
Longitude:	37.6512
Gender:	male
Ear Markings:	Right
Mouth Markings:	Front, Right
Nose Color:	Spotted

On the right side, there is a vertical column of buttons:

- IMAGE GALLERY
- POSITION ON MAP
- EDIT METADATA** (This button is highlighted with a blue dashed box.)
- LION IMAGE SETS
- DELETE LION



The screenshot shows the 'Edit Metadata' form for the same lion profile. The form is divided into several sections:

- Organization:** Lion Guardians
- Lion Name:** 119_Meliyo (id: 81)
- Ear Markings:** RIGHT
- Broken Teeth:** UNKNOWN
- Date Stamp:** Apr 13, 2016
- Date of Birth:** Apr 1, 2010
- Mouth Markings:** YES
- Tail Markings / Missing Tuft:** UNKNOWN
- Latitude:** -2.44697244
- Longitude:** 37.651214
- Age:** 8 (years)
- Nose Color:** SPOTTED
- Eye Damage / Pigmentation:** UNKNOWN
- Gender:** MALE
- Scars:** UNKNOWN
- Location Tag:** Select On Map
- Notes here:** A text area for additional notes.
- Checkboxes:** GPS points and Location on map are Private (checked), Dead Lion (unchecked).
- SAVE** button (highlighted with a blue dashed box).

- 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](#)).

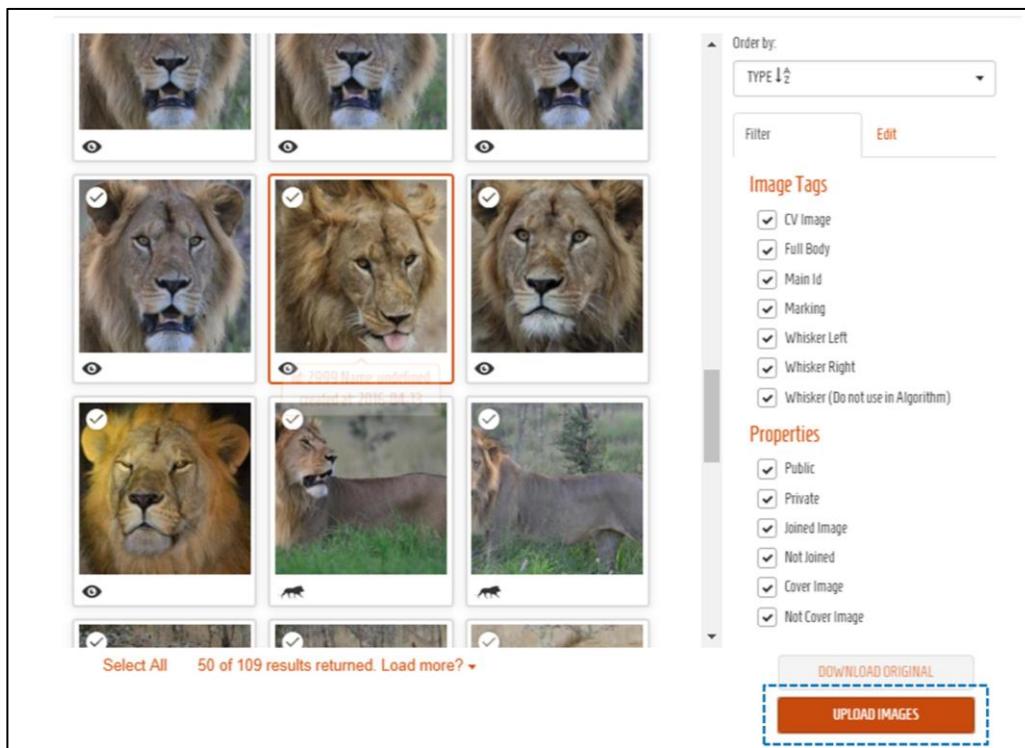
Editing photos

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.

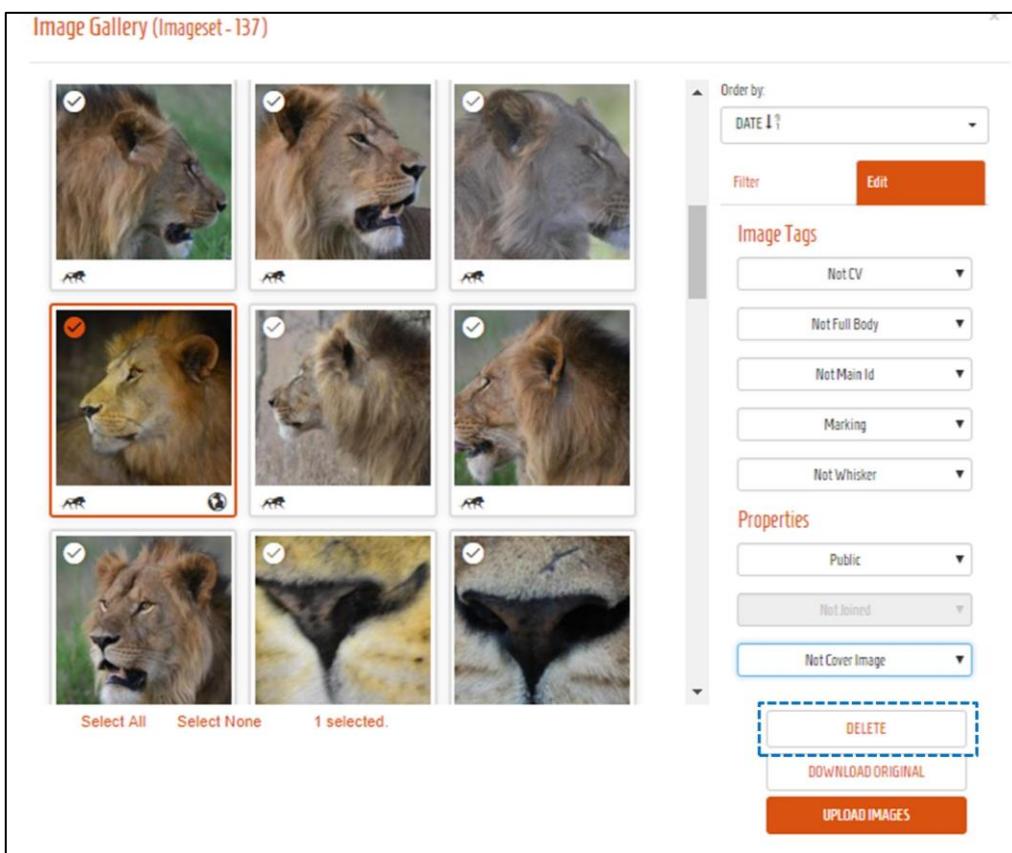
The screenshot shows the 'Lion Info' page for a lion named '119_Meliyo'. On the left, there is a large thumbnail image of the lion's face. Below it, several details are listed: Lion Name: 119_Meliyo, Lion ID: 81, Primary Image Set ID: 137, Organization: Lion Guardians, Verified: Yes, and Date Stamp: Apr 13, 2016. In the center, there are sections for 'Notes:' and 'Relatives:', each with a small icon and a link. To the right, there is a vertical sidebar with several buttons: 'IMAGE GALLERY' (which is highlighted with a blue dashed box), 'POSITION ON MAP', 'EDIT METADATA', 'RELATIVES', 'LION IMAGE SETS', and '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](#)).



To delete a photo from an image set:

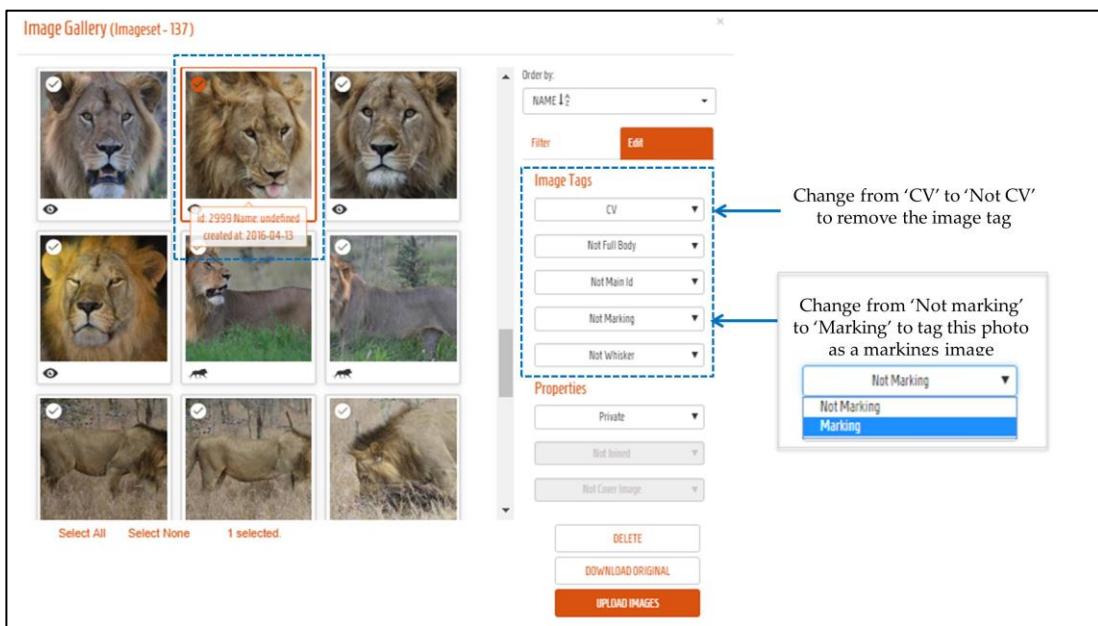
- In the image gallery, select the photo(s) you want to delete (click the white tick button in the top left corner of each photo- it will turn orange when the photo is selected). Then



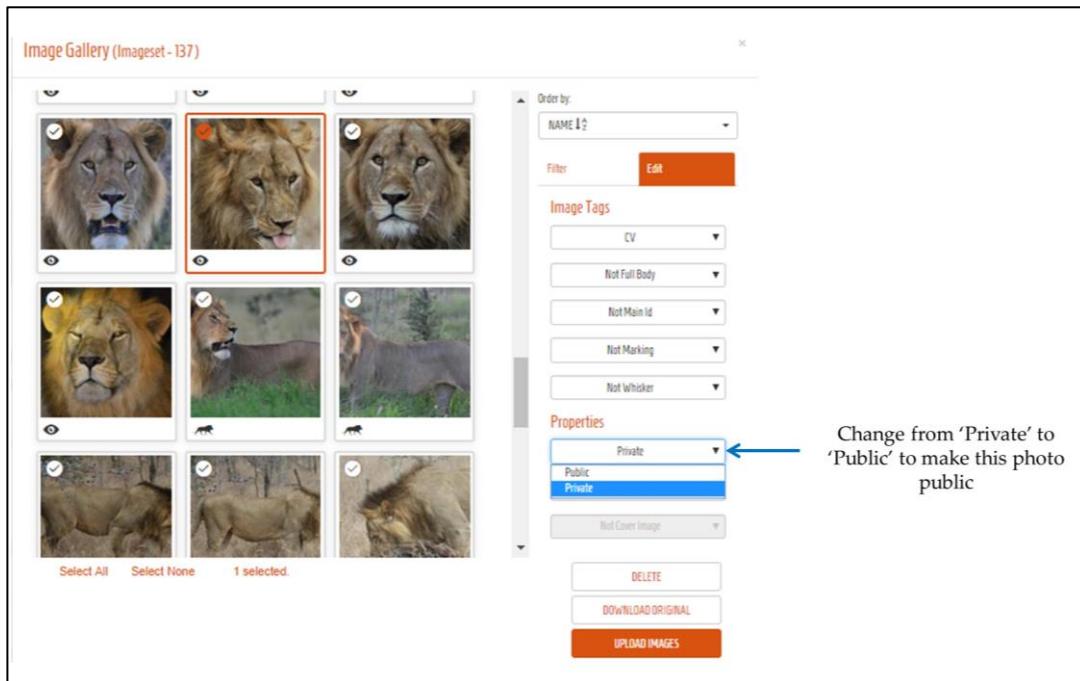
press the **DELETE** button to remove the selected photo(s) from this gallery. You will then receive a notification that the photo has been successfully deleted.

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*.



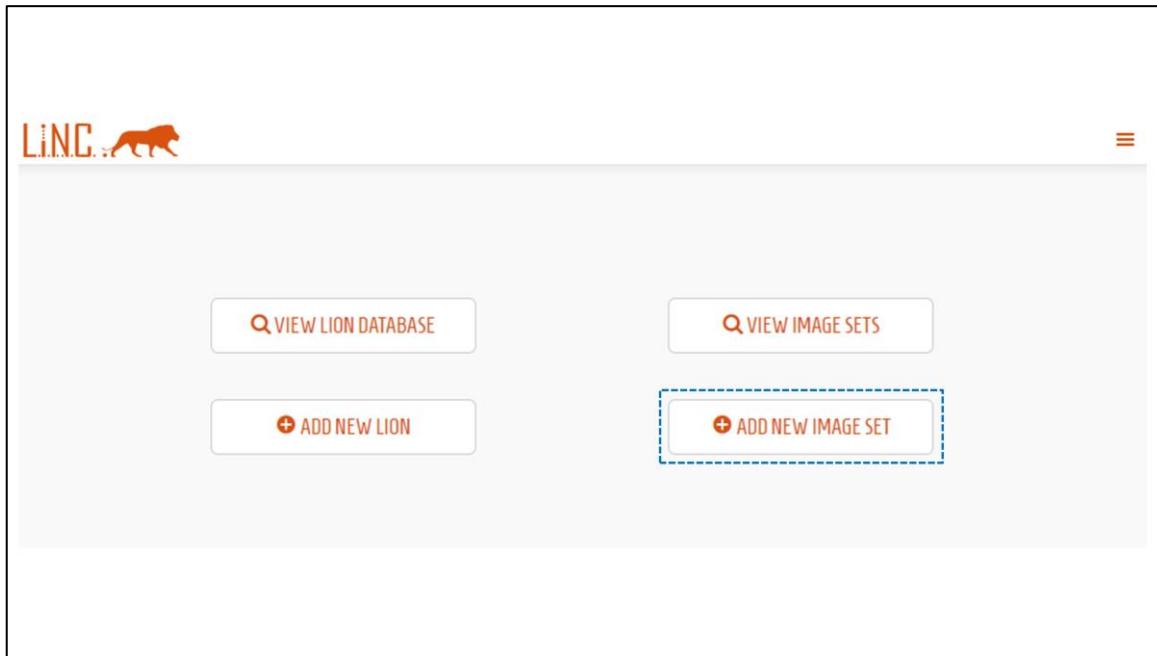
ADDING A NEW IMAGE SET/OBSERVATION FOR A LION

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. 39](#)).

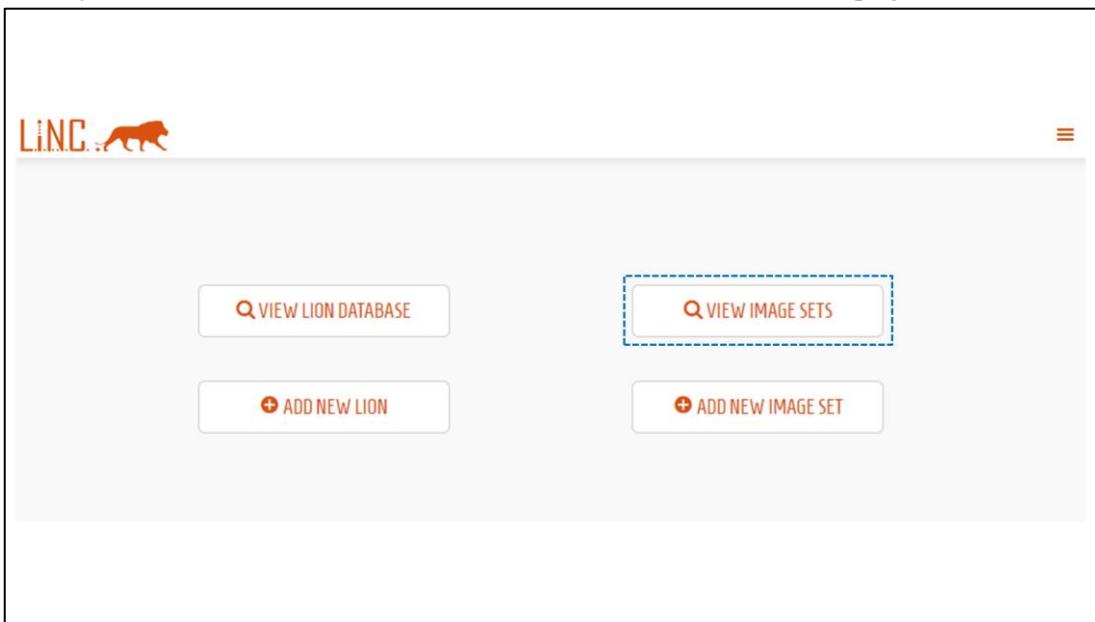
Adding new image sets

To add a new image set/observation of a lion, go to the homepage (click the LINC 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 ([see pg. 16](#)). Then add the photos for this observation ([see pg. 18](#)). 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.



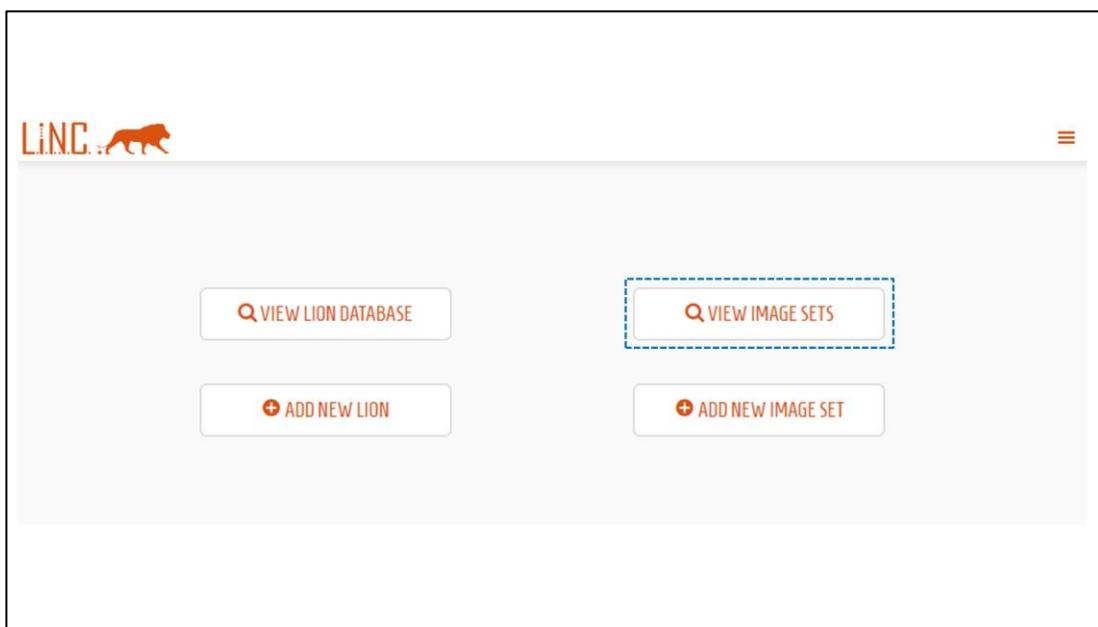
However, this newly created image set is **not yet linked to/associated with any lion individual in the database** (you can see there is no name written under the *Lion Name* field). To link this image set to the relevant lion, [see below](#).

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. 39](#) 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**



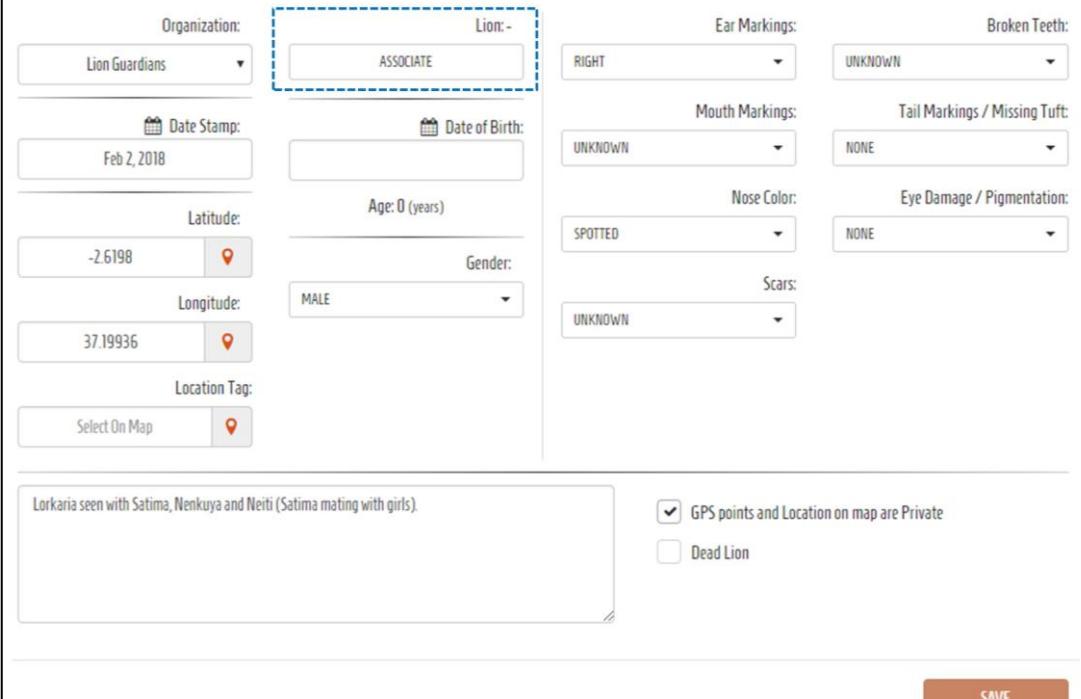
The screenshot shows the 'Image Set Info' page. On the left, there is a thumbnail image of a lion's head. To its right, the 'Notes' field contains the text: 'Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls.)'. Below the notes, there are several metadata fields:

- Image Set ID:** 538
- Lion Name:** -
- Lion ID:**
- Organization:** Lion Guardians
- Verified:** No
- Date Stamp:** Feb 2, 2018
- Date of Birth:** -

On the right side of the page, there is a vertical column of buttons:

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

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



The screenshot shows the 'Edit Metadata' page. In the center, there is a section labeled 'Lion:' with a dropdown menu. Below it, there is a button labeled 'ASSOCIATE' which is highlighted with a dashed blue border. To the right of this section, there are several other input fields:

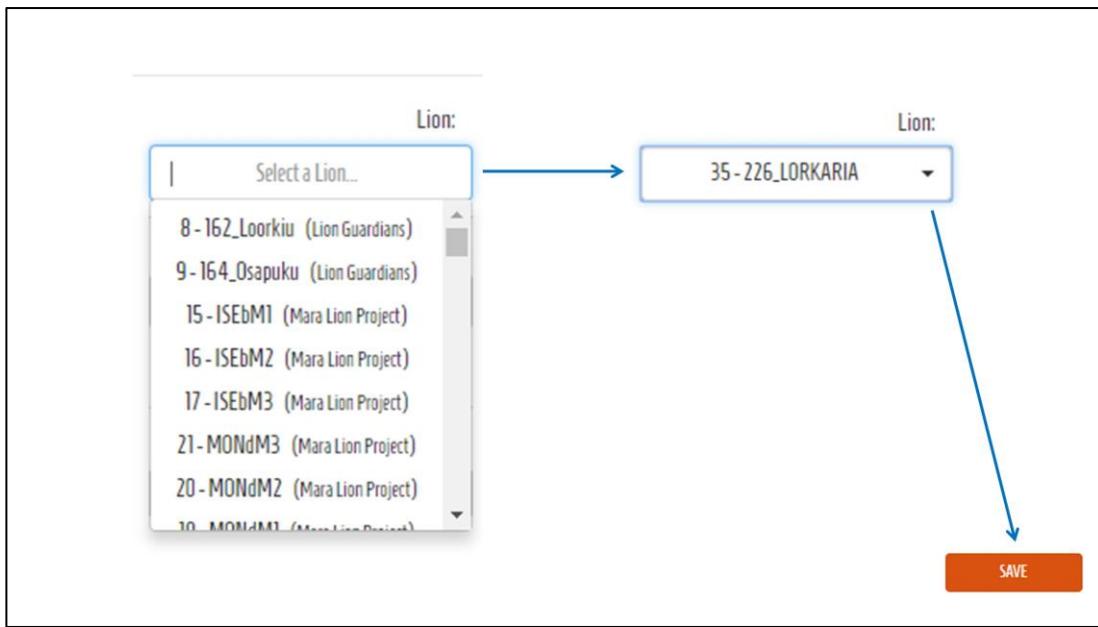
- Ear Markings:** RIGHT
- Broken Teeth:** UNKNOWN
- Mouth Markings:** UNKNOWN
- Tail Markings / Missing Tuft:** NONE
- Nose Color:** SPOTTED
- Eye Damage / Pigmentation:** NONE
- Scars:** UNKNOWN

At the bottom of the page, there is a note: 'Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls.)'. To the right of the note, there are two checkboxes:

- GPS points and Location on map are Private
- Dead Lion

At the very bottom right, there is a large orange 'SAVE' button.

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.

Image Set ID: 538	Notes: Lorkaria seen with Satima, Nenkuya and Neiti (Satima mating with girls).	IMAGE GALLERY
Lion Name: 226_Lorkaria		POSITION ON MAP
Lion ID: 35		EDIT METADATA
Organization: Lion Guardians		SWITCH TO NEW LION
Verified: Yes		DELETE IMAGE SET
DISASSOCIATE		SET AS PRIMARY
Date Stamp: Feb 2, 2018		

Please note that dissociating does not delete the image set, but simply 'un-joins' it. To delete the image set, [see pg. 33](#).

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](#).

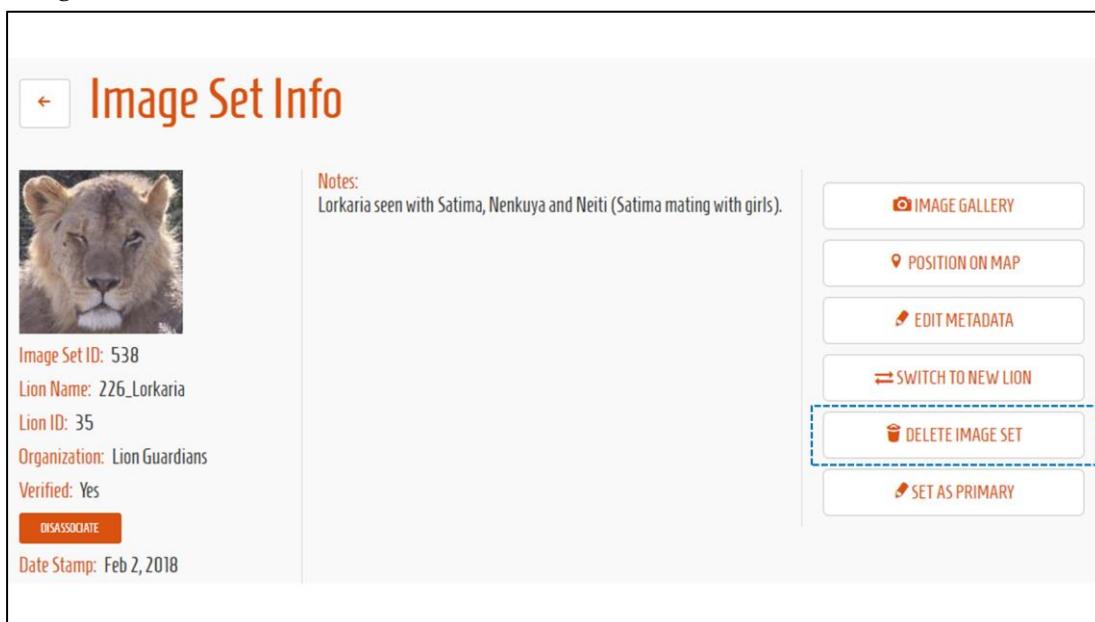
- First navigate to the image set you want to edit (by opening the primary profile of the lion, clicking **LION IMAGE SETS**, and then select the relevant image set row you wish to edit. [See pg. 24 for details](#) on how to view image sets).
- From here the steps are the same as editing a primary profile's metadata and photos ([see pg. 33 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.



- 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. 15](#)), 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.

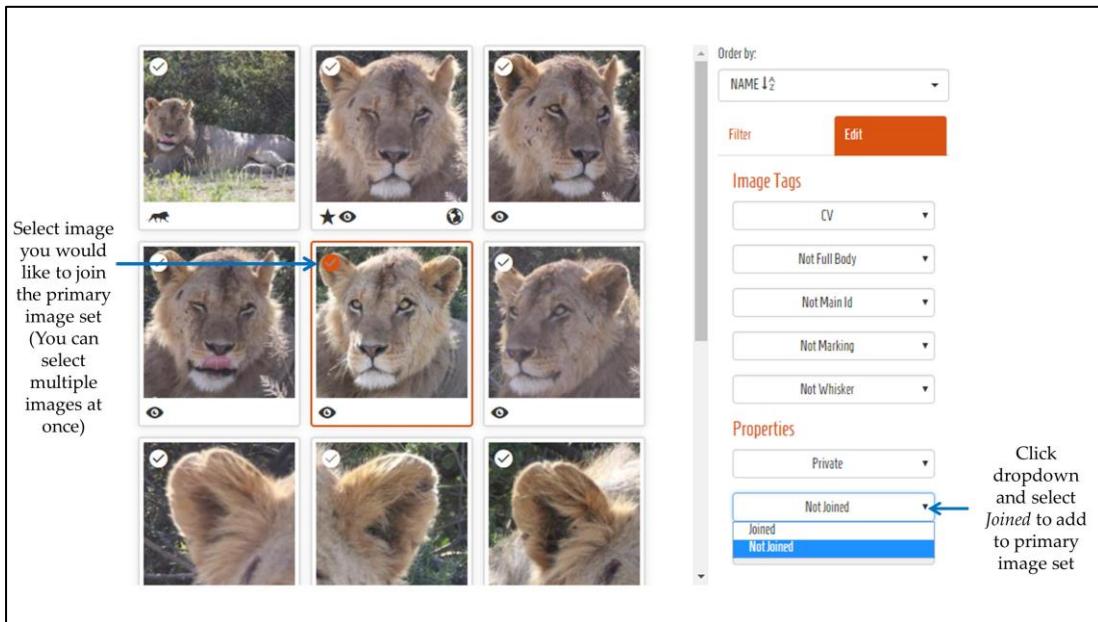
LINC makes it easy to add photos from additional/associated image sets to the primary image set (i.e. the primary profile image gallery) - you can **select specific photos** from the associated image set to be viewed in the primary profile image gallery².

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).

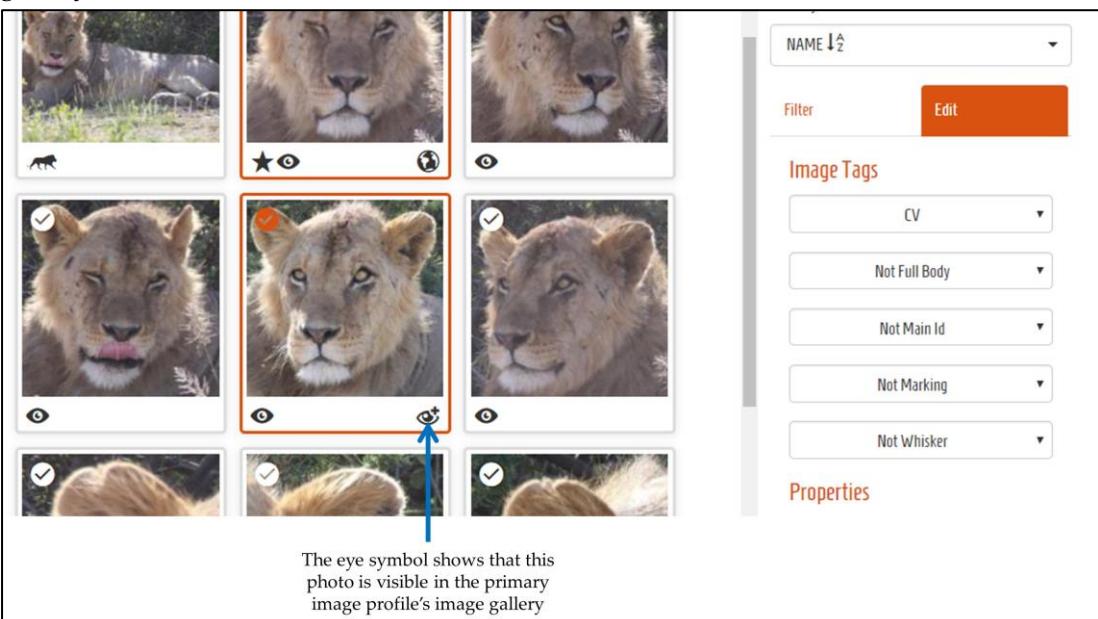
² The photos will also still be visible in the associated image set's gallery.

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

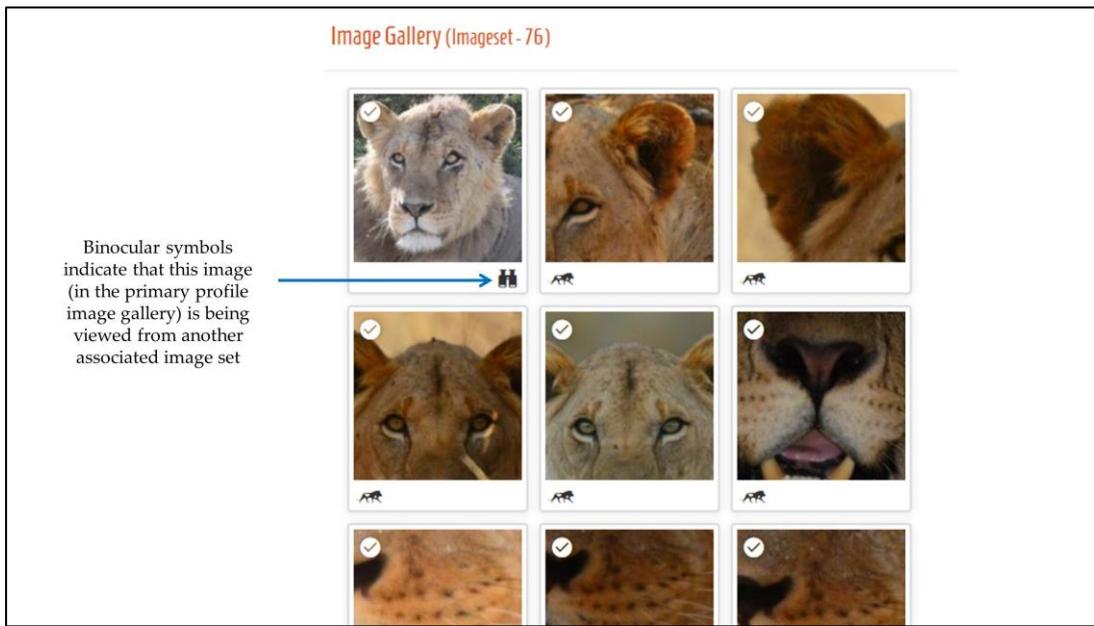


- These photos will now be visible in the gallery of the primary image set. They will also remain visible in the original image set.

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.

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 $\downarrow\uparrow$

Filter **Edit**

Image type

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

Properties

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

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

Lion Details:

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

Actions:

- 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 analyzing 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:

LINC

Actions:

- VIEW LION DATABASE
- VIEW IMAGE SETS
- ADD NEW LION
- ADD NEW IMAGE SET

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.

The screenshot shows a web-based application titled "View Lion Database". On the left, there is a sidebar titled "Refine by" containing four sections: "Name or ID", "Organization", "Age", and "Gender". The "Organization" section has a checkbox for "Lion Guardians" which is checked. The "Age" section has a range selector set to "0-5". The "Gender" section has a checkbox for "Male" which is checked. A blue dashed box labeled "Filters" encloses these four sections. To the right of the sidebar is a table titled "47 lions found." with the following columns: Photo, Name, Imageset Id, Age, Dead, Organization, Gender, Latitude, Longitude, GPS Points Private, Date Stamp, and Verified. The table lists 17 entries, each with a small thumbnail photo, a name like "322_Empelung'u", an Imageset Id (e.g., 359, 284, 282, etc.), an age (e.g., 3 y/o, 2 y/o, 2 y/o, etc.), and a gender (e.g., male, male, male, etc.). The last two columns show the date stamp (e.g., Jan 31, 2017, Dec 1, 2016, Dec 1, 2016, etc.) and a verified status (e.g., ✓, ✓, ✓, etc.). A blue bracket on the right side of the table points to the text: "Listed lions that match the description in the filter: 0-5 years old, males, from the Lion Guardians' database".

Photo	Name	Imageset Id	Age	Dead	Organization	Gender	Latitude	Longitude	GPS Points Private	Date Stamp	Verified
	322_Empelung'u	359	3 y/o		Lion Guardians	male	-2.665363	37.821499	✓	Jan 31, 2017	✓
	352	284	2 y/o		Lion Guardians	male	-2.385956	37.339771	✓	Dec 1, 2016	✓
	350_Loing'oni	282	2 y/o		Lion Guardians	male	-2.362550	37.323029	✓	Dec 1, 2016	✓
	349_Nkayioni	281	2 y/o		Lion Guardians	male	-2.362550	37.323029	✓	Dec 1, 2016	✓
	347_Lorgeti	280	5 y/o		Lion Guardians	male	-2.551074	37.775670	✓	Nov 29, 2016	✓
	346_Giraffe boy b	279	5 y/o		Lion Guardians	male	-2.551074	37.775670	✓	Nov 29, 2016	✓
	345_Giraffe boy A	278	5 y/o		Lion Guardians	male	-2.551074	37.775670	✓	Nov 29, 2016	✓
	335_Lethani	276	2 y/o		Lion Guardians	male	-2.332386	37.301968	✓	Nov 28, 2016	✓
	327_Gurme	275	2 y/o		Lion Guardians	male	-2.470445	37.329098	✓	Nov 28, 2016	✓
	326_Lormesau	274	2 y/o		Lion Guardians	male	-2.470445	37.329098	✓	Nov 28, 2016	✓

- 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:

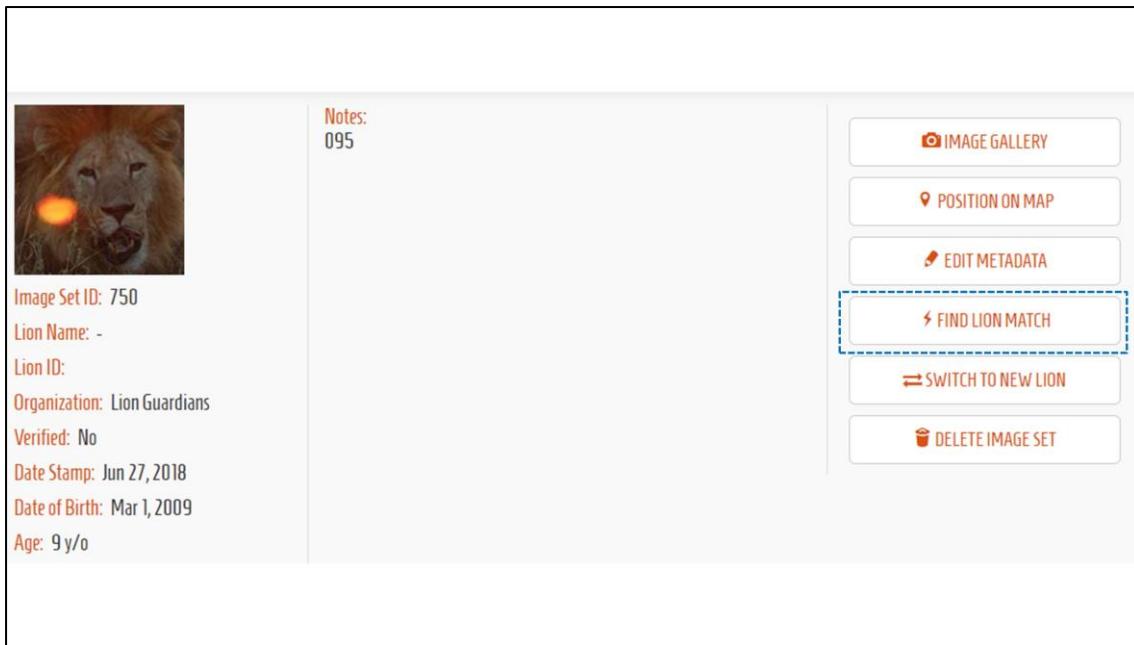
- **Name/ID**- Insert the lion's given name/code if known
- **Organization**- tick all the organisation's whose lions you want to check against
- **Age**- move the slider so that it displayed lions within the range of ages you want to see
- **Gender**- tick the sex of the lions you want to see in the 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 ([as explained above, pg. 37](#)), 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 dialog box contains the following sections:

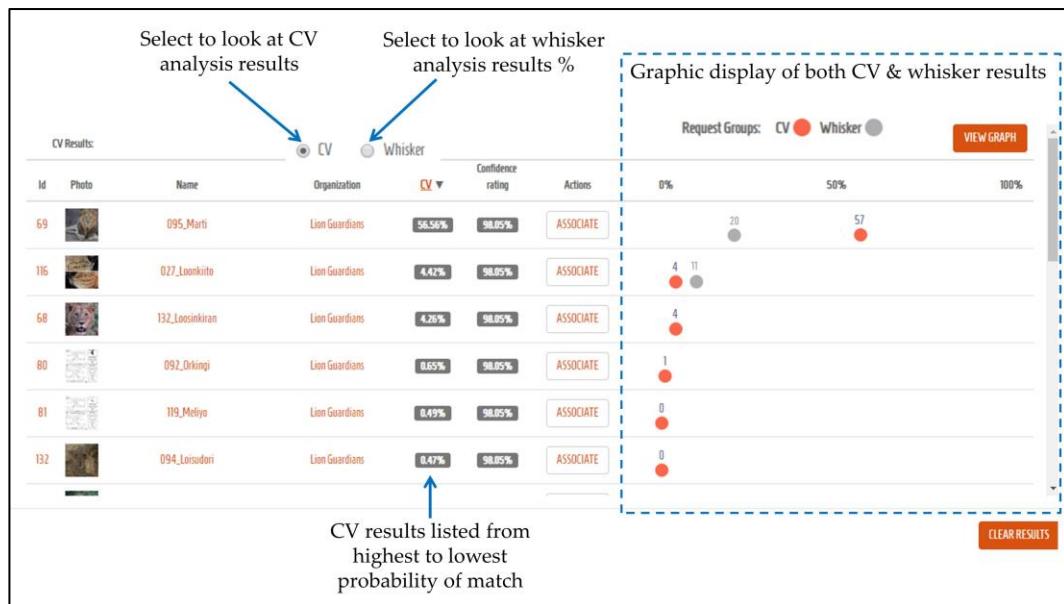
- Filter to reduce the list of lions the auto-ID tool has to compare against**: Includes a slider for 'Age' (0-32), 'Gender' (Male, Female, Unknown), 'Features', 'Location', and 'Classifier' (CV, Whisker).
- 133 lions filtered**: A table listing 133 lions with columns: ID, Name, Age, Location, Organization, and Gender.
- Select which type of analysis to run**: Buttons for 'CV' and 'Whisker'.
- FIND LION MATCH**: A brown button labeled 'Click button to run'.

- 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 page displays:

- A large image of a lion's face.
- Notes:**
- Lion details: Image Set ID: 750, Lion Name: -, Lion ID: -, Organization: Lion Guardians, Verified: No, Date Stamp: Jun 27, 2018.
- Action buttons on the right:
 - IMAGE GALLERY
 - POSITION ON MAP
 - EDIT METADATA
 - VIEW CV RESULTS** (button highlighted with a dashed blue border)
 - SWITCH TO NEW LION
 - DELETE IMAGE SET

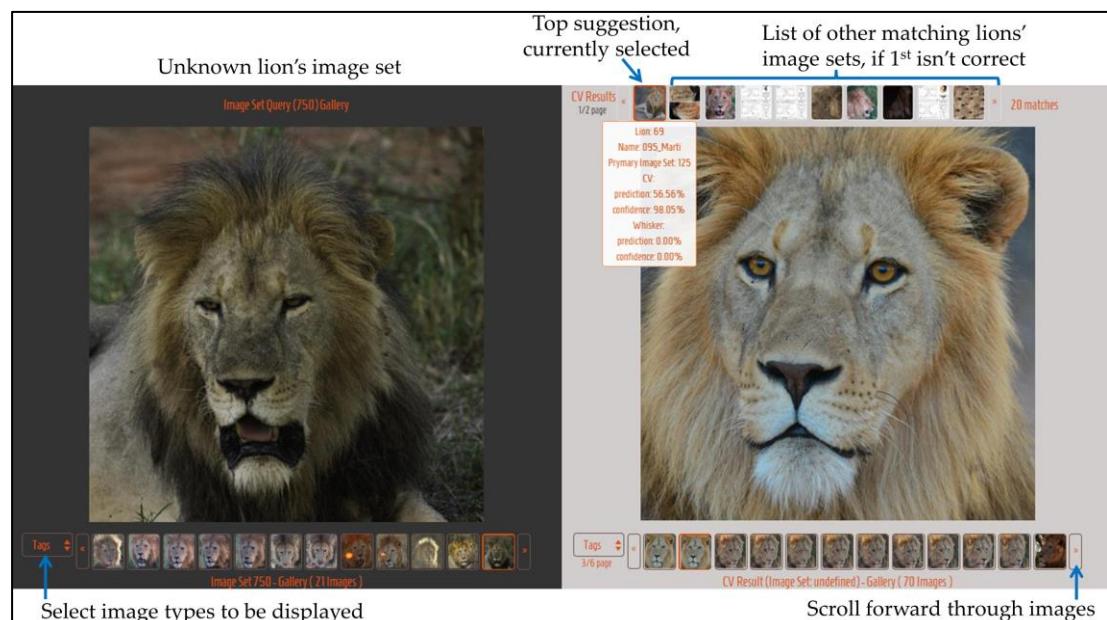
- The resulting suggestions for matching lions are listed in order of likelihood from highest to lowest for each type of test run (CV or Whiskers). To view results suggested by the CV algorithm, select the button labelled **CV**, to view the results suggested by whisker pattern analysis click the button 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:

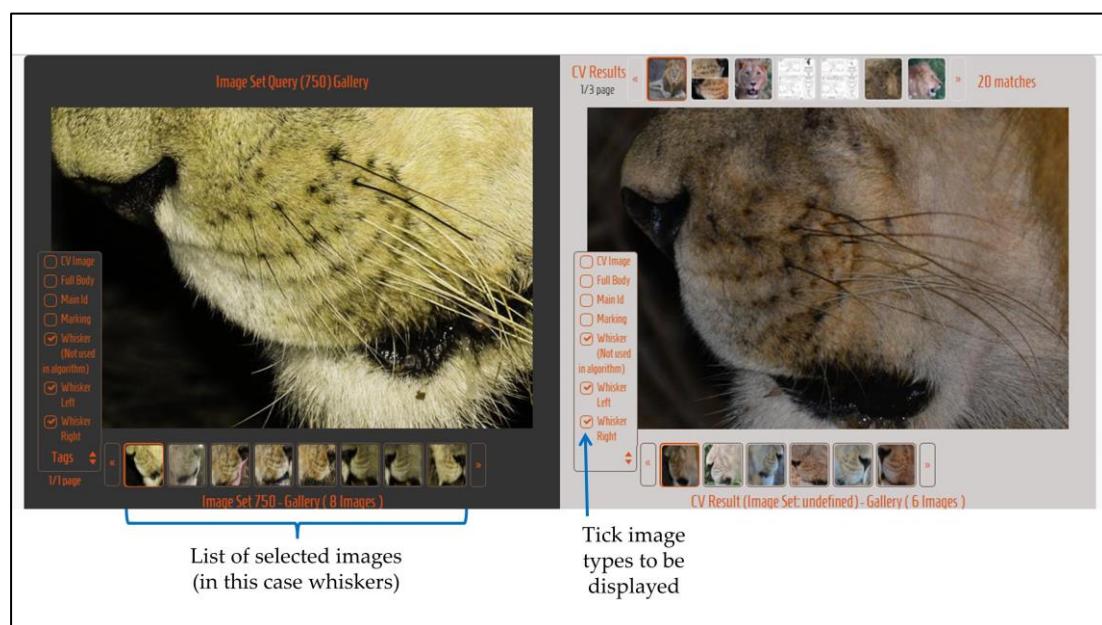
- The **CV%** indicates the confidence of the CV algorithm in predicting the right lion
- The **WHISKER%** indicates the confidence of the whisker pattern recognition algorithm in predicting the right lion
- The **CONFIDENCE RATING** indicates the likelihood of accuracy, based on the number of photos 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).

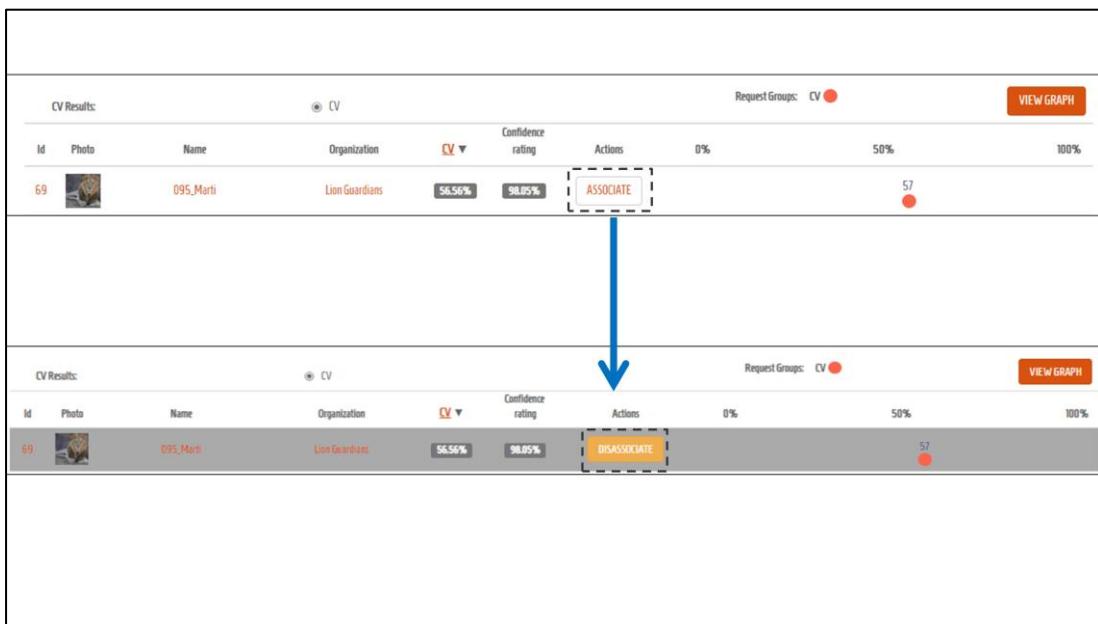


Here, the **unknown lion's image set is on the left** and the image set for the **suggested matching lion is on the right**. All the other suggested lion's image sets are listed in a row on the top of the right side image (listed from highest % match to lowest, left to right, or however you sorted the 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 images 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.



- 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 ([see pg. 34](#)).

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.

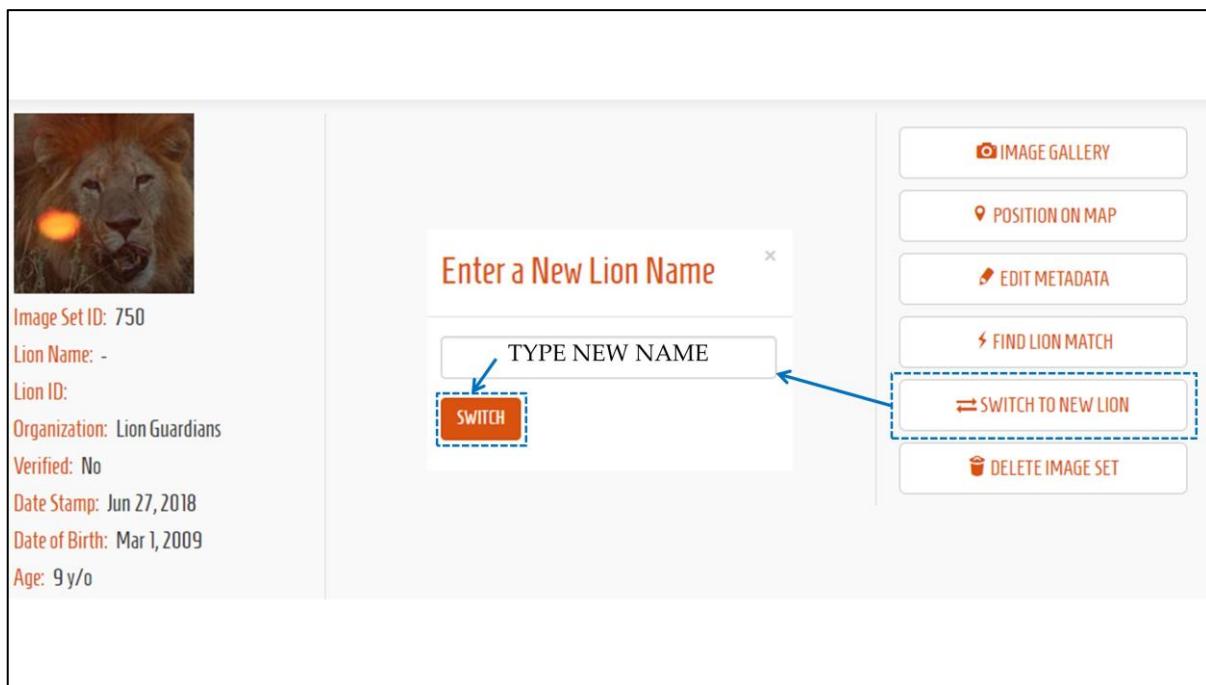
Note:

- 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.

Refine by

Name or ID	<input checked="" type="checkbox"/>
Organization	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Lion Guardians <input type="checkbox"/> Mara Lion Project <input type="checkbox"/> Athi-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"/> Soysambu Conservancy <input type="checkbox"/> KW5-Nakuru National Park	
Age	<input checked="" type="checkbox"/>
<input type="button" value="0 - 3"/> <input type="button" value="12 - 32"/>	
Gender	<input checked="" type="checkbox"/>
Features	<input checked="" type="checkbox"/>
Location	<input checked="" type="checkbox"/>
Geographical	<input checked="" type="checkbox"/>
<input type="button" value="SELECT BATCH MODE"/>	

155 lions found.

Id	Photo	Name	ImageSet Id	Age	Dead	Organization	Gender	Latitude	Longitude	GPS Points	Private	Date Stamp	Verified
419		272_Nkasuku	783	4 y/o		Lion Guardians	female	-2.716794	37.280563	x		Jun 13, 2018	✓
418		266_Nemeshenai	782	4 y/o		Lion Guardians	female	-2.726424	37.126789	x		Feb 5, 2016	✓
417		265_Narkayarr	781	4 y/o		Lion Guardians	female	-2.726424	37.126789	x		Feb 5, 2016	✓
416		261_Nenkuuya	780	4 y/o		Lion Guardians	female	-2.642125	37.234215	x		May 20, 2018	✓
415		259_Netti	779	4 y/o		Lion Guardians	female	-2.642125	37.234215	x		May 20, 2018	✓
414		202_Ngosuani	778	5 y/o		Lion Guardians	female	-2.485573	37.317594	x		Feb 10, 2014	✓
413		201_Nenkusero	777	5 y/o		Lion Guardians	female	-2.485573	37.317594	x		Feb 10, 2014	✓
412		163_Nempatipat	776	7 y/o		Lion Guardians	female	-2.339934	37.301015	x		Sep 10, 2013	✓
411		149_Ntinyika	775	7 y/o		Lion Guardians	female	-2.343483	37.660889	x		Oct 30, 2013	✓
410		102	774	9 y/o		Lion Guardians	female	-2.635314	37.271134	x		Oct 22, 2009	✓

View Lion Database

Refine by

Name or ID	<input checked="" type="checkbox"/>
Organization	<input checked="" type="checkbox"/>
Age	<input checked="" type="checkbox"/>
Gender	<input checked="" type="checkbox"/>
Features	<input checked="" type="checkbox"/>
Location	<input checked="" type="checkbox"/>
Geographical	<input checked="" type="checkbox"/>
<input type="button" value="DISABLE BATCH MODE"/>	
<input type="button" value="EDIT"/>	
<input type="button" value="EXPORT"/>	
<input type="button" value="DELETE"/>	
155 are selected	

155 lions found.

<input checked="" type="checkbox"/>		202_Ngosuani	778	5 y/o	Lion Guardians	female	-2.485573	37.317594	x		Feb 10, 2014	✓
<input checked="" type="checkbox"/>		201_Nenkusero	777	5 y/o	Lion Guardians	female	-2.485573	37.317594	x		Feb 10, 2014	✓
<input checked="" type="checkbox"/>		163_Nempatipat	776	7 y/o	Lion Guardians	female	-2.339934	37.301015	x		Sep 10, 2013	✓
<input checked="" type="checkbox"/>		149_Ntinyika	775	7 y/o	Lion Guardians	female	-2.343483	37.660889	x		Oct 30, 2013	✓
<input checked="" type="checkbox"/>		410	774	9 y/o	Lion Guardians	female	-2.635314	37.271134	x		Oct 22, 2009	✓
<input checked="" type="checkbox"/>		409	773	9 y/o	Lion Guardians	female	-2.430096	37.302999	x		Sep 12, 2010	✓
<input checked="" type="checkbox"/>		408	772	10 y/o	Lion Guardians	female	-2.69282	37.162336	x		Feb 11, 2011	✓
<input checked="" type="checkbox"/>		407	771	12 y/o	Lion Guardians	female	-2.273838	37.686237	x		Oct 31, 2013	✓
<input checked="" type="checkbox"/>		380	624	4 y/o	Lion Guardians	female	-2.726424	37.126789	✓		Feb 5, 2016	✓
<input checked="" type="checkbox"/>		379	623	4 y/o	Lion Guardians	female	-2.288697	37.187473	✓		Feb 1, 2018	✓
<input checked="" type="checkbox"/>		378	622	4 y/o	Lion Guardians	female	-2.549744	37.384010	✓		Feb 25, 2018	✓

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.

Lion Data												
		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"/>	506		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	

 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.

LINC.

Lion Data												
		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"/>	506		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

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 Mangodb 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.