



# **Aging the African Lion**

**A Training on Aging Lions**

**Version 2 (February 2022)**

## Authors

Jennifer R. B. Miller  
Paul Funston

## Citation

Miller, Jennifer R. B. and Funston, P. 2022. Aging the African Lion. Available at <http://agingtheafricanlion.com>.

## Photo credits

Matthew Becker, Colleen Begg, Henry Brink, Alayne Cotterill, Stephanie Dolrenny, Jane Hunt, Ingela Jansson, Andrew Loveridge, David MacDonald, Craig Packer, Daniel Rosengren, Ken Stratford, Martina Trinkel, Paula White, Christiaan Winterbach and Hanlie Winterbach.

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# Background and Applications

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## Lions in Africa

As the dominant predator in Africa, the African lion (*Panthera leo*) is highly valued for its ecological role and importance for the tourism industry. However, lions have declined by an estimated 42% over the past 21 years (3 generations) to approximately 20,000 individuals (Bauer et al. 2015). Robust tools for assessing and managing lion population dynamics are critical for survival of the species.

## Why Age Lions?

Age is a common metric used throughout the world to guide the management, research and sustainable harvest of many types of wildlife, including large carnivores, ungulates and fish. Knowing an animal's age is critical for accurately estimating key elements of wildlife behavior and life history, such as reproduction, survival, movement and population size. Our ability to successfully conserve and manage wildlife depends on how well we understand each animal's social and biological role, which is closely tied to age.

## Implications for Management and Research

Managers use population models based on the age structure of a population to help predict how different management scenarios or environmental stressors might affect the future of a species. Population models project a species' population size based on information about a species' life history, including conception rate, birth rate, survival of young, age at puberty, territoriality and other behavioural characteristics. The age or life stage of an animal is closely tied to its reproduction, survival, behavior, and other aspects of its ecology that can affect population stability. Thus, an animal's age in the context of its population can provide valuable information about the future of a single population and, for threatened species like the African lion, even the species as a whole.

For this reason, age is an important metrics collected by lion researchers. For example, researchers that collar individual lions must be able to accurately age the lions they study in order to understand lion behaviour in a broader context. Ensuring that lions have the natural resources and the protection that they require at different phases of their lives is critical for ensuring their conservation.

## Importance for Sustainable Hunting

Lions are the only social big cats in the world. Each pride consists of 4-5 adult lionesses, their dependent cubs, and a temporary coalition of pride males. Pride males play a key role in defending their pride against invading males by forming coalitions of 2-3 males to defend the pride territory through roaring, patrolling, scent marking and aggressively approaching invading males. When new males enter a pride, they often kill cubs (a behavior termed "infanticide") in order to bring lionesses into estrus more quickly so they can produce offspring. Infanticide

ensures that the new male will pass on his genes to boost his reproductive fitness, while reducing the fitness of previous pride males.

The social nature of lions and common use of infanticide means that lion populations are greatly impacted by the loss of males. For example, when 72% of the adult males studied in Hwange National Park, Zimbabwe were harvested by hunters, these pride males were replaced by invading males that caused high rates of infanticide and disrupted population stability (Loveridge et al. 2007). Many of the harvested males were sub-adults less than 4 years old and had few opportunities to reproduce, making their loss especially impactful on the long-term stability of the population.

Because of this, trophy hunting must be managed in a way that reduces infanticide to achieve sustainable lion populations and long-term harvests. Simulation models suggest that sustainable trophy hunting can be accomplished by harvesting only adult males that have raised cubs to independence. (Note that females should never be harvested because their removal consistently leads to population decline). The age of physical and sexual maturation in male lion differs slightly between geographic areas of Africa, with males in East Africa maturing by around 4 years (Whitman et al. 2004) and males in southern Africa maturing by 6-7 years (Loveridge et al. 2007). Reproducing and raising cubs to independence typically requires an additional 1-2 years.

Studies have found that to be sustainable (achieve stable lion populations and maximum harvests), trophy hunting should harvest lions in East Africa (Tanzania) older than 6 years (Whitman et al. 2004, 2007) and lions in southern Africa older than 8 years. As a general rule, harvesting males older than 8 years maximizes both the quantity and the quality of the long-term harvest. The science of aging lions in part grew out of the need for more reliable indicators of age to make trophy hunting sustainable.

# Resources

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## Resources for Learning to Age Lions

The ability to accurately age lions takes time and practice to develop, but is the sign of a dedicated and accomplished expert who understands lion biology. We encourage you to take advantage of the other resources that were developed alongside this training by visiting <http://agingtheafricanlion.com>, including:

- Test – Measure your lion aging accuracy
- Photo gallery – Images of known-age lions
- Pocket guides – Quick tips for aging

## Before You Begin: Test Yourself!

To see your improvement after taking this training, we encourage you to test your lion aging score online at <http://agingtheafricanlion/testyourself.com>. When you finish the training, test yourself again!

# Training

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## How to Age a Lion

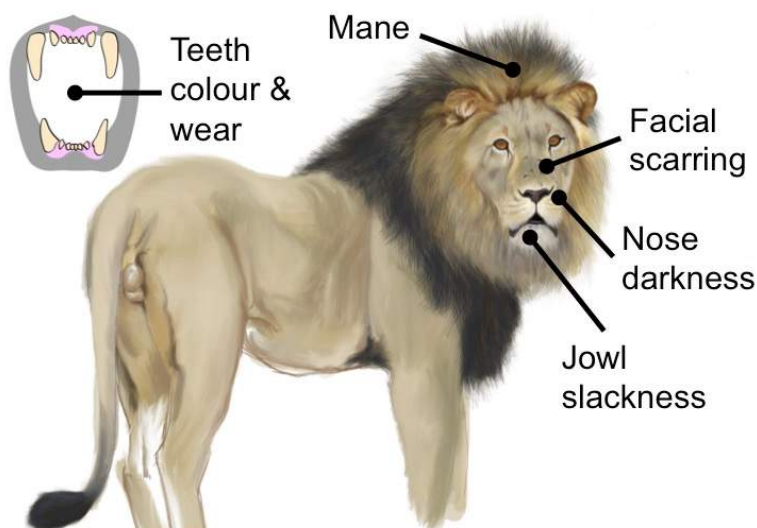
Scientific research on lions across Africa shows that a male lion's appearance changes with five main physical characteristics that can be distinguished into four age classes (Miller et al. 2016):

### Aging Characteristics

- Teeth color and wear
- Facial scarring
- Nose darkness
- Mane
- Slack jowl

### Age classes

- 1-2 years
- 3-4 years
- 5-6 years
- ≥7 years



Minor variation in each physical characteristic between lions of the same age means that a single trait should never be used alone to determine age: always reference 3-4 characteristics to reliably narrow down a lion's age. This will ensure the greatest accuracy possible.

# Aging Characteristics

## 1. Teeth Color and Wear

Teeth become more yellow and worn with age.



**1-2 years**  
White, sharp



**3-4 years**  
Light yellow,  
sharp or lightly worn



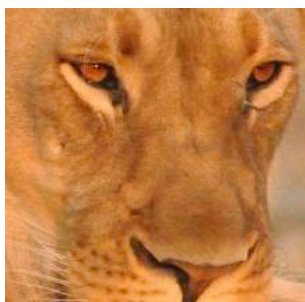
**5-6 years**  
Light yellow,  
lightly or heavily worn



**≥7 years**  
Dark yellow, lightly  
or heavily worn

## 2. Facial Scarring

Lions acquire scarring and pocketing on their faces due to fighting.



**1-2 years**  
No scarring



**3-4 years**  
No or light scarring



**5-6 years**  
Light scarring



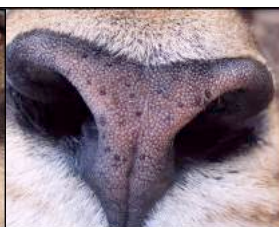
**≥7 years**  
Heavy scarring

## 3. Nose Darkness

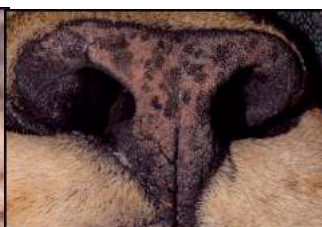
Lion noses darken from pink to black with age.



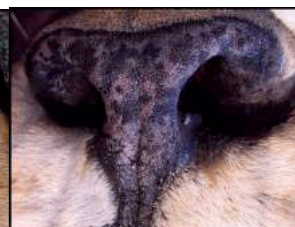
**1-2 years**  
Mostly pink  
0-30% black



**3-4 years**  
Slightly black  
20-60% black



**5-6 years**  
Mostly black  
40-70% black



**≥7 years**  
Nearly all black  
40-100% black

## 4. Mane

A male's mane grows from a spiky 'Mohawk' into a long coat covering a male's back, shoulders, head and chest. Mane is the only trait that differs between regions, based on climate. Below we show differences in mane in different regions.

### *Southern and High-Lying Africa*

*(e.g. Hwange in Zimbabwe, Serengeti in Tanzania)*

In cooler climates, manes are longer, thicker and grow more quickly.



#### **1-2 years**

No hair or very short Mohawk on head, with bare patches between Mohawk and ears. No or very sparse mane around face, chest and neck.

#### **3-4 years**

Long Mohawk on head with bare patches between Mohawk and ears. Short mane around face, chest and neck. No shoulder mane.

#### **5-6 years**

No Mohawk; full, long mane with forehead and shoulders filled in.

#### **≥7 years**

Full, long mane, frayed or frizzy hair; might be missing in some places.

Note: Other traits (jowl slackness, facial scarring, teeth wear) are more indicative of this age.

**West-Central and Eastern Low-Lying Africa  
(e.g. Niassa in Mozambique, Selous in Tanzania)**

In hot climates, manes are shorter, sparser and slower growing (1-2 years 'behind' cooler climate males). Manes here can be used to classify lions into 3 age classes.



**1-3 years**

No hair or very short Mohawk on head, with bare patches between and behind ears. No or very sparse mane around face, chest and neck.



**4-5 years**

Long Mohawk on head with bare patches between ears and Mohawk and behind ears. May extend between shoulders.



**≥6 years**

Bare patch behind ears filled in. Longer mane with full ring around face. Long Mohawk may still be present. Older lions have sparser and shorter manes.

## 5. Slack Jowl

A lion's back lip hangs in about half of individuals older than 7 years.



**1-2 years**  
No slack jowl



**3-4 years**  
No slack jowl



**5-6 years**  
No slack jowl



**≥7 years**  
Slack jowl in 50% of lions in this age group



# Next Steps

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## Photo Galleries & Pocket Guides

After finishing this training, check out the other resources available at

<http://agingtheafricanlion.com>:

- Test – Measure your lion aging accuracy
- Photo gallery – Images of known-age lions
- Pocket guides – Quick tips for aging

## After You Finish: Re-Test Yourself

To see your improvement after reviewing this training and the online photos and pocket guides, re-test your lion aging accuracy online at

<http://agingtheafricanlion/testyourself.com>.

## Pocket Guides

Pocket guides to use for quick reference in the field are available on the last pages of this course packet and online at <http://agingtheafricanlion.com/resources>

# Additional Reading

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Links to many of these articles are freely available at <http://agingtheafricanlion.com>

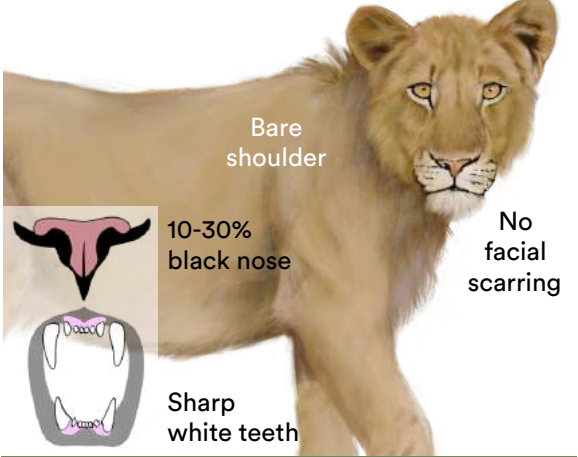



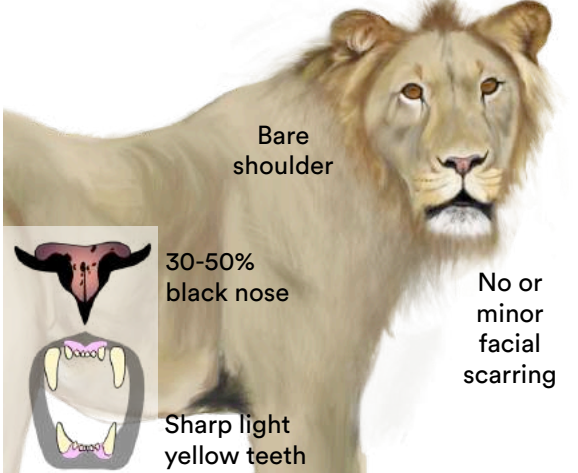

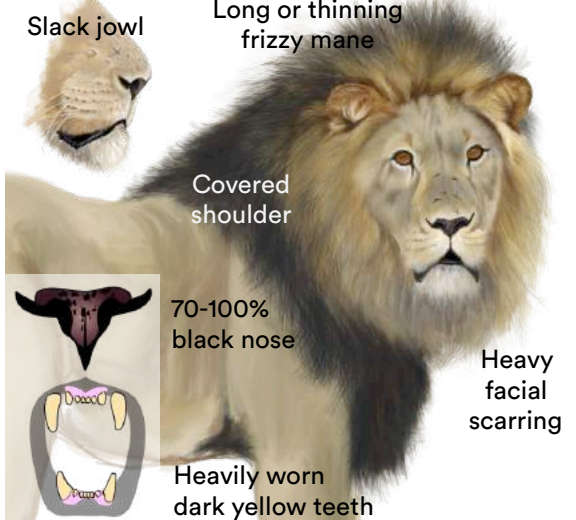

## Lion Biology

- Funston, P. J., M. G. L. Mills, P. R. K. Richardson, and A. S. van Jaarsveld. 2003. [Reduced dispersal and opportunistic territory acquisition in male lions \(\*Panthera leo\*\)](#). *Journal of Zoology* 259:131–42. **Free!**
- Mosser, A., and C. Packer. 2009. [Group territoriality and the benefits of sociality in the African lion, \*Panthera leo\*](#). *Animal Behaviour* 78:359–370.
- Packer, C., D. Scheel, and A. E. Pusey. 1990. [Why lions form groups: food is not enough](#). *American Naturalist* 136:1–19. **Free!**
- Pusey, A. E., and C. Packer. 1994. [Non-offspring nursing in social carnivores: minimizing the costs](#). *Behavioral Ecology* 5:362-374.

## Aging Lions and Sustainable Trophy Hunting

- Creel, S., M'soka, J., Droge, E., Rosenblatt, E.G., Becker, M. S., Matandiko, W., Simpamba, T. 2016. [Assessing the sustainability of African lion trophy hunting, with recommendations for policy](#). *Ecological Applications*, doi: 10.1002/eap.1377.
- Loveridge, A. J., A. W. Searle, F. Murindagomo, and D. W. Macdonald. 2007. [The impact of sport-hunting on the population dynamics of an African lion population in a protected area](#). *Biological Conservation* 134:548–558.
- Miller, J., Funston, P. J., Balme, G., Lindsey, P. A., Loveridge, A. J., Becker, M. S. Begg, C., Brink, H., Cotterill, A., Dolrenry, S., Hunt, J. E., Jansson, I., MacDonald, D. W., Mandisodza-Chikerema, R., Packer, C., Rosengren, D., Stratford, K., Trinkel, M., White, P., Winterbach, C., Winterbach, H. E. K. 2016. [Aging traits and sustainable trophy hunting of African lions](#). *Biological Conservation* 201:160-168. **Free!**
- Rosenblatt, E., Becker, M. S., Creel, S., Droge, E., Mweetwa, T., Schuette, P. A., Watson, F., Merkle, J., Mwape, H. 2014. [Detecting declines of apex carnivores and evaluating their causes: An example with Zambian lions](#). *Biological Conservation* 180:176–186. **Free!**
- White, P. A. , Belant, J. L. 2016. [Individual variation in dental characteristics for estimating age of African lions](#). *Wildlife Biology* 22: 71–77. **Free!**
- White, P. A., Ikanda, D. , Ferrante, L., Chardonnet, P., Mesochina, P., Cameriere, R. 2016. [Age estimation of African lions \*Panthera leo\* by ratio of tooth areas](#). *PLoS ONE*. Doi: 10.6084/m9.figshare.3159430. **Free!**
- Whitman, K. L., Starfield, A. M., Quadling, H. S., and C. Packer. 2004. [Sustainable trophy hunting of African lions](#). *Nature* 428:175–178. **Free!**
- Whitman, K. L., Starfield, A. M., Quadling, H., Packer, C. 2007. [Modeling the effects of trophy selection and environmental disturbance on a simulated population of African lions](#). *Conservation Biology* 21:591–601. **Free!**

# Quick Guide to Southern and High-Lying Africa (e.g. Hwange in Zimbabwe, Serengeti in Tanzania)

MATURE CUBS: 1-2 years	PRIME ADULTS: 5-6 years
<p>No forehead hair or short Mohawk</p>  <p>Bare shoulder</p>  <p>10-30% black nose</p> <p>No facial scarring</p> <p>Sharp white teeth</p>	<p>Forehead covered, no Mohawk</p>  <p>Shoulder filling in</p>  <p>50-70% black nose</p> <p>Minor facial scarring</p> <p>Lightly worn light yellow teeth</p>
SUB-ADULTS: 3-4 years	OLDER ADULTS: 7 years & older
<p>Short or long Mohawk</p>  <p>Bare shoulder</p>  <p>30-50% black nose</p> <p>No or minor facial scarring</p> <p>Sharp light yellow teeth</p>	<p>Slack jaw</p> <p>Long or thinning frizzy mane</p>  <p>Covered shoulder</p>  <p>70-100% black nose</p> <p>Heavy facial scarring</p> <p>Heavily worn dark yellow teeth</p>

Available as complete pocket guide at <http://agingtheafricanlion.com/resources>

# Quick Guide to West-Central and Eastern Low-Lying Africa (e.g. Niassa in Mozambique, Seleous in Tanzania)

## MATURE CUBS: 1-2 years

No forehead hair or short Mohawk

Bare shoulder

10-30% black nose

No facial scarring

Sharp white teeth

## PRIME ADULTS: 5-6 years

Long Mohawk and bald spot behind ears

Mane may extend between shoulders

50-70% black nose

Minor facial scarring

Lightly worn light yellow teeth

## SUB-ADULTS: 3-4 years

Short Mohawk and bald spot behind ears

Bare shoulder

30-50% black nose

No or minor facial scarring

Sharp light yellow teeth

## OLDER ADULTS: 7 years & older

Slack jowl

Mohawk may still be present, mane filled in behind ears

Covered shoulder

Full mane ring around face

70-100% black nose

Heavy facial scarring

Heavily worn dark yellow teeth

Available as complete pocket guide at <http://agingtheafricanlion.com/resources>.