

**PRESENTATIONS**  
**SESSION XI**  
**EX SITU REPRODUCTION AND**  
**MANAGEMENT**

## Elephant and Rhino Symposium Presentation

Jane Kennedy

Lead Keeper, San Diego Zoo Safari Park

Regional Studbook Keeper, Greater One-horned Rhinoceros

Vice-president, International Rhino Keeper Association

“Relationships Among Birth Presentation, Amniotic Sac Rupture and Stillbirths in Rhinoceros.”

Once spread across the entire northern part of the Indian subcontinent, the greater one-horned rhinoceros is currently considered vulnerable (Talukdar et al, 2008). Given this species is conservation dependent, it is vital to have sustainable populations within zoological facilities. This requires putting significant time and resources into the greater one-horned rhino population and determining factors leading to high reproductive success. In spring 2012 the San Diego Zoo Safari Park experienced a difference between two greater one-horned rhinoceros births. One was a successful live birth, anterior presentation, and the other was a dystocia stillbirth, posterior presentation. Initially the stillbirth was suspected to be due to the posterior presentation at birth. However, years of anecdotal evidence suggested otherwise and a formal investigation was initiated.

Data were gathered by reviewing animal records including behavioral and breeding records for all three species of the San Diego Zoo Safari Park's rhinoceros. Data on 173 rhino births between 1970 and 2013 were analyzed for species of rhino, and whether or not the birth was recorded as a live birth or stillbirth. Breeding records indicated that 5.3% (n = 93 total births) of the southern white rhinos born at the park were stillborn compared to 0.6% for black rhinos (n = 15 total births) and 24.5% for greater one-horned rhinos (n = 65 total births). Compared to the studbooks for each of these species through to 2010, records indicate southern white rhinos have a captive born stillborn rate of 7%, black rhinos at 11.0%, and greater one-horned rhinos at 19.7%. This information led to further investigation as to why greater one-horned rhinos have such a high rate of stillborns.

The North American Studbook for greater one-horned rhinos lists 126 births at 35 institutions of which 29 were stillbirths. The San Diego Zoo Safari Park alone represents approximately 51.6% of births for greater one-horned rhinos within zoological institutions. Similarly, 16 of the 29 stillbirths have occurred at the park representing 55.2% suggesting the park is quite representative of the greater one-horned rhino population within zoological institutions and this high percentage of still births is not an abnormal occurrence for just one institution. Thus, determining the cause behind the higher percentage of stillbirths could substantially help this population increase sustainability.

While data are limited, 12 births have been video recorded at the San Diego Zoo Safari Park including 8 greater one-horned, 2 southern white and 2 black rhinos. The vast majority of births at the park happen when no one is around and/or no data relevant to this study could be recorded.

Information from these videos was gathered on delivery presentation and presences of sac rupture. Seven additional births had written documentation for presentation and are included but are not considered for sac rupture analysis. Three of these were also recorded, but the video is either lost or misplaced and is not available to confirm sac rupture. Delivery presentation was analyzed as follows. If a calf was born with its front feet and head presenting first it was considered an anterior presentation. If a calf presented with its rear feet first it was considered a posterior presentation. Additionally feet positioning is crucial for presentation and normal delivery. The feet need to be hoof pad “down” for an anterior delivery, as opposed to hoof pad “up” for a posterior delivery.

Of the 19 births 11 calves were delivered in posterior presentation and 7 were delivered in anterior presentation, and one is unknown. Eight of the 12 births that were recorded were live births, 4 were stillborns. In all four cases of a stillbirth delivery, the amniotic sac ruptured prior to delivery of the stillborn. Three were posterior presentation, and one is unconfirmed. Additionally all greater one-horned live births recorded did not have the sac rupture prior to delivery. However, one black rhino birth had the sac rupture prior to birth but still resulted in a live birth, so the number of minutes between sac rupture and delivery may be significant.

Looking at position, one stillborn in this study presented initially with a posterior presentation, but the pads of the feet were facing downward. Since the calf was delivering back feet first, this was an “upside down” position in the birth canal. This female over the course of several hours had the calf rotate to the proper position before delivery but resulted in a stillborn. While anterior versus posterior delivery may not be significant, the position of the calf with pads up or down may be significant, further information is still needed.

With the limited results and surrounding questions, rhino births published on Youtube were then incorporated into the data. The caveat for addition of these recordings is that all births are live births, as no facility would be expected to post video of a stillbirth. Thus these recordings do not necessarily add to the evidence for premature sac rupture as evidence for a stillborn. Nine Youtube videos of rhinos giving birth were evaluated including 4 southern white rhinos, 2 black rhino and 3 greater one-horned rhinos. Data from the southern white rhinos shows that 3 delivered in anterior presentation, 1 was in the posterior presentation. Both black rhino deliveries were anterior presentation and the 3 greater one-horned rhinos included 1 anterior and 2 posterior. All nine rhinos had the amniotic sac intact at time of delivery.

During conversations at the San Diego Rhino Keeper Workshop in May of 2013, additional video data was offered by the Chester Zoo, England. In 2012 they had 2 black rhino give birth; one was a dystocia, posterior presentation with amniotic sac rupture that resulted in the assisted delivery of a dead calf. This calf was delivered over 24 hours after the initial presentation of a single back foot. The other was a normal anterior birth, sac intact at time of delivery.

Additional data was also submitted by the Buffalo Zoo and Cincinnati Zoo and Botanical Gardens. All of the submitted data was recorded.

Preliminary data suggests that presentation at delivery must not be discounted as a factor in stillbirths in rhinoceros considering all 4 stillbirths were posterior presentation. The single live birth with premature sac rupture (a black rhino) indicates that even if the sac ruptures, a live birth is possible. The link may be the time between sac rupture and delivery of the calf. One theory is that the amniotic sac needs fluid in it to help protect the umbilical cord from compression during delivery. If the sac is ruptured and the cushioning effect of the fluid is lost, pressure on the umbilicus may result in loss of oxygen to the calf. Therefore premature sac rupture must be considered as a possible link to stillborn.

Rhinoceros birthing has been observed dozens of times in zoos with a general consensus on what constitutes a “normal” birth. A more comprehensive evaluation of what constitutes a “normal” birth in rhinoceros is needed, but as of this time has not been published. Thus some of the data analysis in this paper is limited to generalizations for rhinoceros approved by the AZA Rhino TAG. Therefore the following is considered a “normal” delivery.

Though rhinos may be in labor for extended periods of time, once the feet are showing the calf comes quickly, usually in less than one hour. If a calf’s feet are presented and the dam takes more than one hour to deliver, it often results in a compromised, stillborn or dead calf. A normal delivery is one that results in the birth of a calf within 60 minutes of feet presentation, with no additional factors. A dystocia birth is any birth that does not follow the normal parameters.

For many species amniotic sac rupture prior to delivery is not an issue. Horses often deliver after the amniotic sac has ruptured delivering a healthy live foal. The difference may be that an anterior delivery is considered normal as opposed to posterior. If the front feet and head are already out of the birth canal, the foal has the ability to breathe on its own during delivery. Since rhinoceros are able to deliver normally both anterior and posterior, premature amniotic sac rupture may contribute to the delivery of a stillborn calf. For the purposes of this study amniotic sac rupture is considered as a possible reason for stillbirth and thus significant.

More data on not only greater one-horned rhino birthing but all rhino birthing will better answer the questions of the relationships between birth presentation, premature amniotic sac rupture and stillbirths in rhinoceros. Through the International Rhino Keeper Association a request for information was sent to members to send videos of their rhino births adding to the data pool for study. While several institutions have recorded births, few are willing to share footage of the birth in a public format, losing control over who observes such recordings. A compromise is to ask each institution to use set criteria for analysis and provide data as opposed to provide videos. This information is still being gathered and will be added to the data in the future to hopefully gain a better understanding of stillbirths in rhinos.

## References

Talukdar, B.K., Emslie, R., Bist, S.S., Choudhury, A., Ellis, S., Bonal, B.S., Malakar, M.C., Talukdar, B.N. & Barua, M. 2008. *Rhinoceros unicornis*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Downloaded on **16 July 2013**.

Foaling Guide, Maria S Ferrer, DVM, MS, DACT, Veterinary Medical Teaching Hospital, Kansas State University.

Christman, Joe. AZA North American Regional Comprehensive Studbook for Rhinoceros. 2010.



# “Relationships Among Birth Presentation, Amniotic Sac Rupture and Stillbirths in Rhinoceros.”



- Jane Kennedy, Lead Keeper, San Diego Zoo Safari Park
- North American Regional Studbook Keeper, Greater One-horned Rhinoceros
- Vice-president International Rhino Keeper Association



## Rhino Births



- ▣ 41 years-173 Births
- ▣ No Northern White Rhino
- ▣ 93 Southern White Rhinos, 3 Generations
- ▣ 15 Eastern Black Rhinos, 5 Generations
- ▣ 65 Greater One-horned Rhinos, 7 Generations

## Greater One-horned Rhino



Jakichu and Jontu, our 55<sup>th</sup> calf

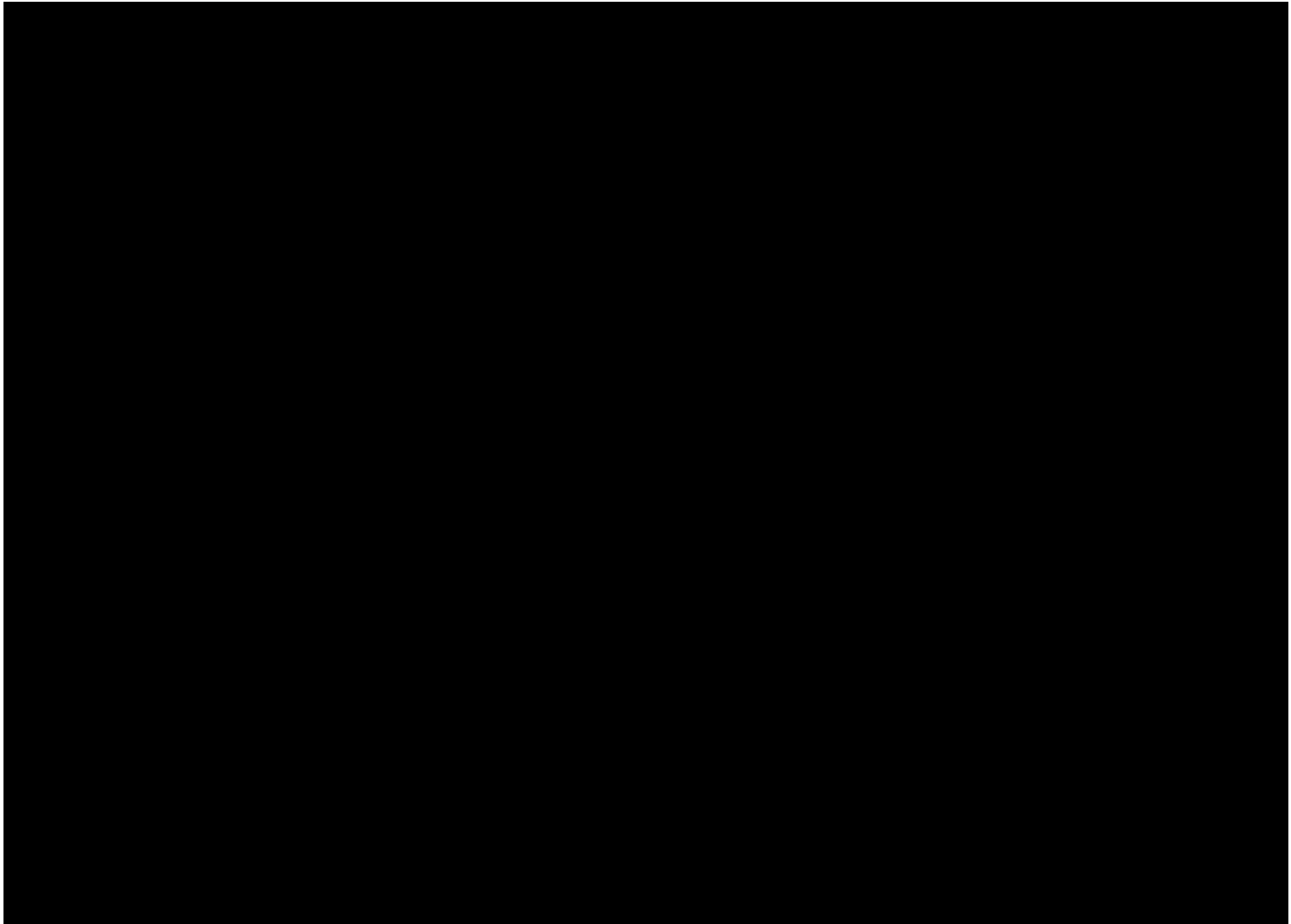
- 1972-1.1 from SDZ
- 1975-1<sup>st</sup> calf born
- 2013-65th calf, a stillbirth
  
- 16 Stillbirths
- 12 of 27 females in NA Studbook have had a stillbirth



SAN DIEGO ZOO.

**SAFARI PARK**

## Stillborn calf March 2012



## SDZSP GOHR Data

- 5 of 6 Anterior live births
- **5 of 8 Posterior live births**
- **1980s UNK live birth**
- **13 March 1994-Jumia live birth**
- **4-Jan-96 –Jumia live birth**
- Dec 2009-Raji live birth
- 15-May-2011-Jatri-dystocia, head first no legs, both die
- **20-Jan-12 –Alta live birth**
- 24-Mar-75-Jaypuri live birth that died
- 28-May-87-Jaypuri live birth
- 27-Jan-90-live birth
- 23-Nov-97-Godavari live birth
- 25-Jan-05-Gari live birth
- **20-October-2010-Asha stillbirth**
- **15-Mar-12 -Asha stillbirth**
- **Jan 5 2013-Kaya stillbirth**

**20-Nov-97 Gainda stillbirth likely posterior, but unconfirmed**

**Bolded are videoed**

## Youtube Data

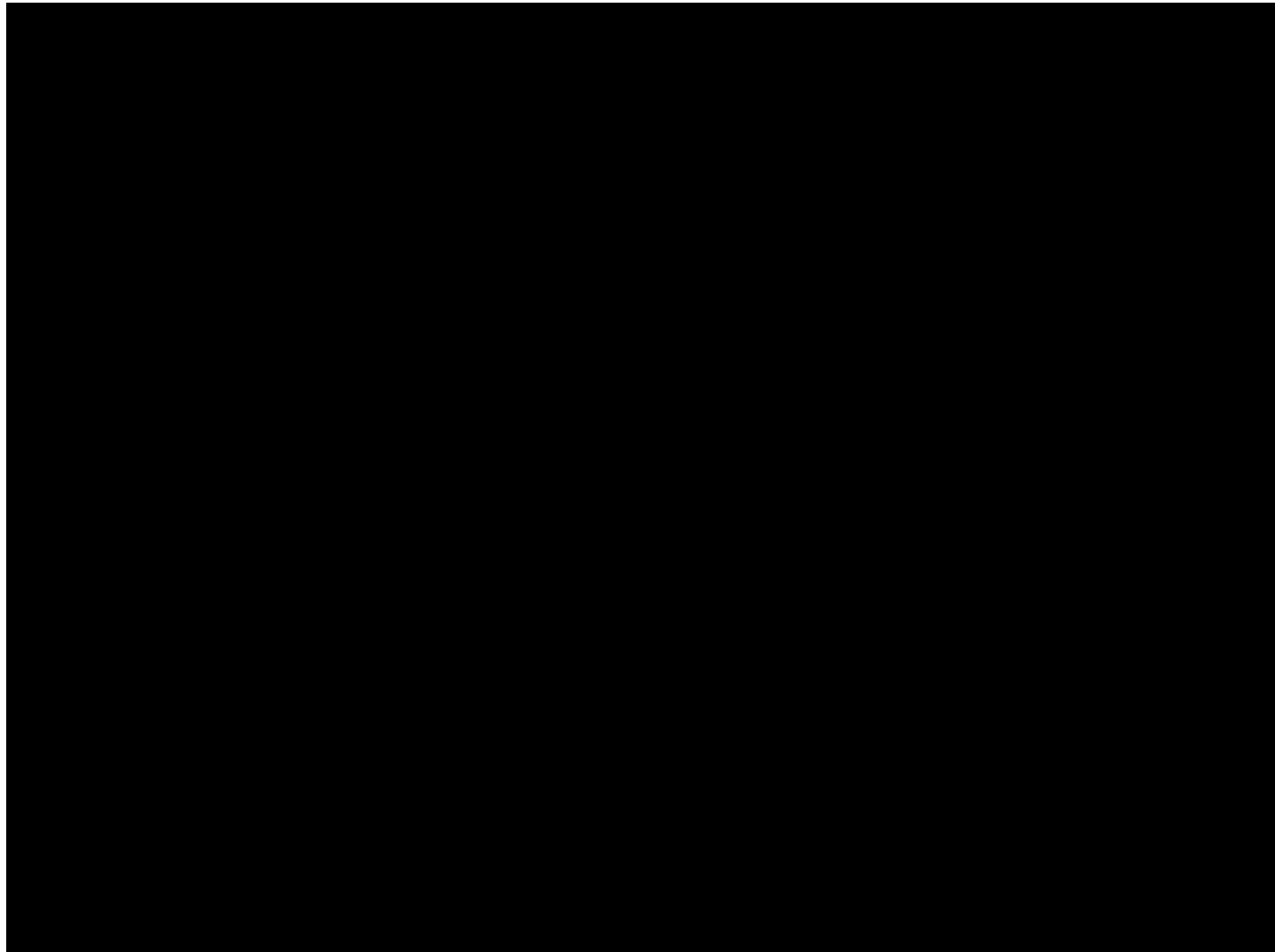
- 3 GOHR, 1 anterior, 2 posterior
- 4 SWR, 2 anterior, 2 posterior
- 1 Black, 1 anterior
- 1 Sumatran, 1 posterior
  
- All Live births, 4 anterior, 5 posterior



SAN DIEGO ZOO.

**SAFARI PARK**

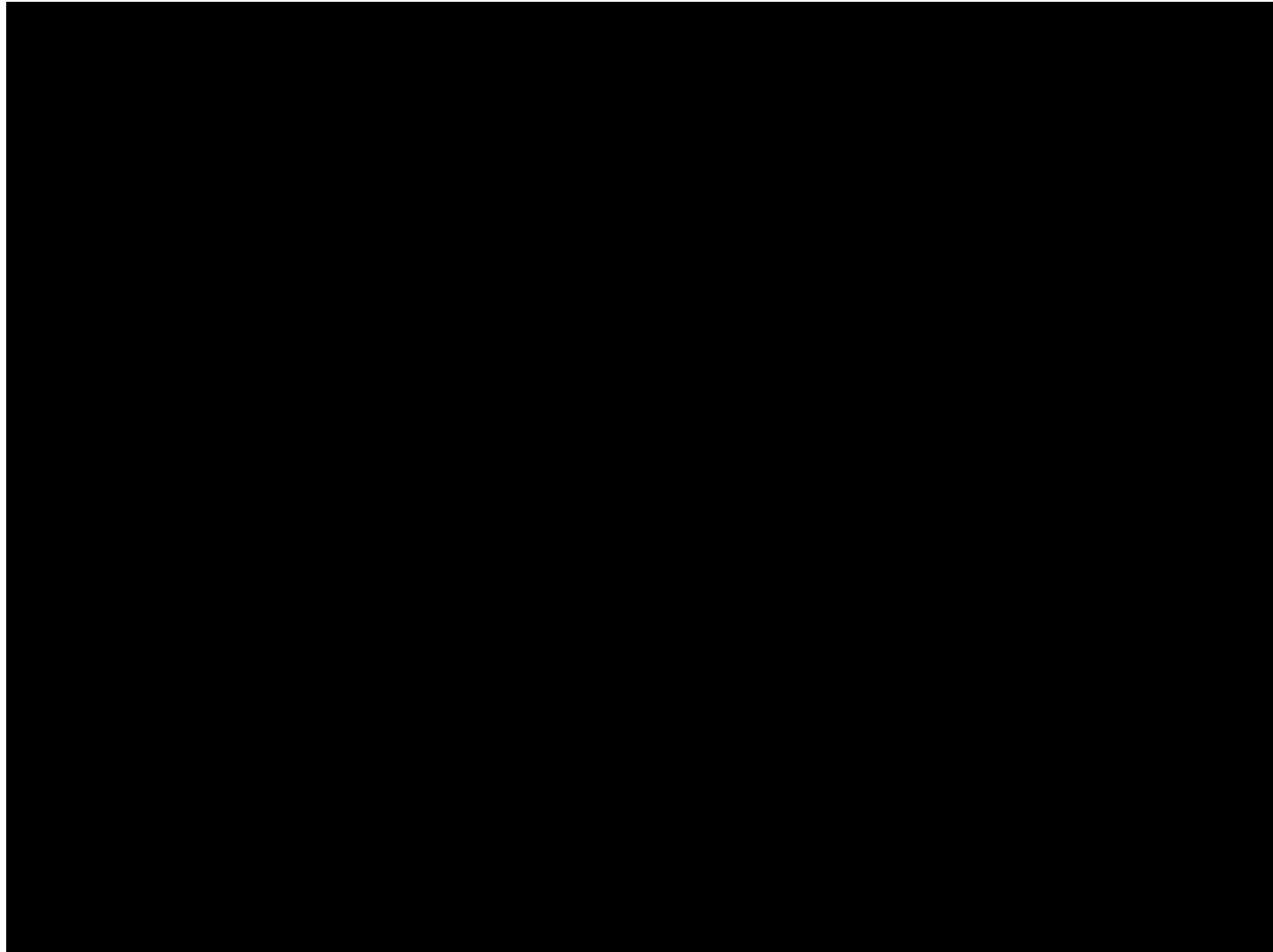
**Asha October 2010**



SAN DIEGO ZOO.

**SAFARI PARK**

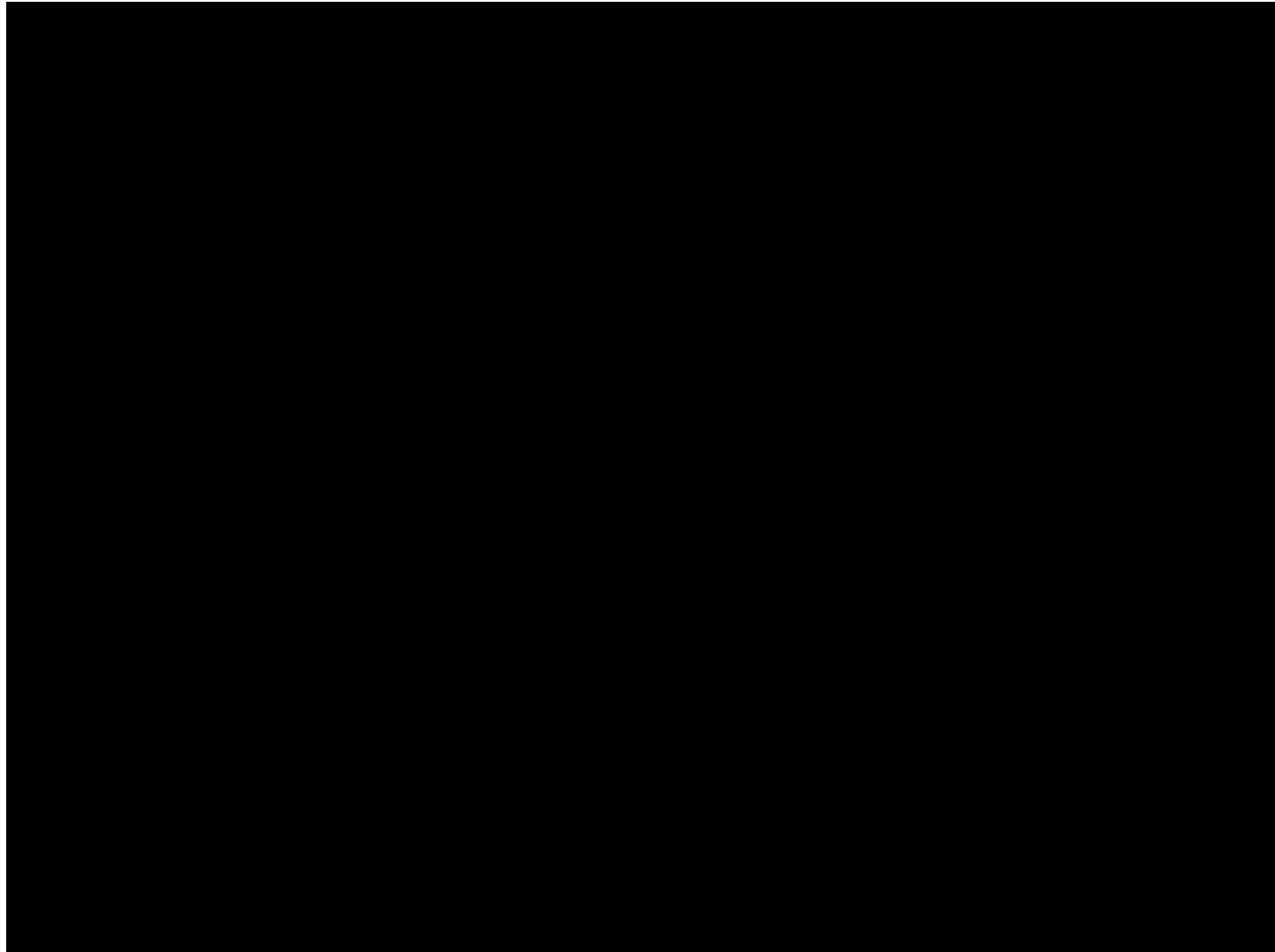
**Asha October 2010**



SAN DIEGO ZOO.

**SAFARI PARK**

**Asha October 2010**





SAN DIEGO ZOO.

**SAFARI PARK**

**Asha October 20, 2010**

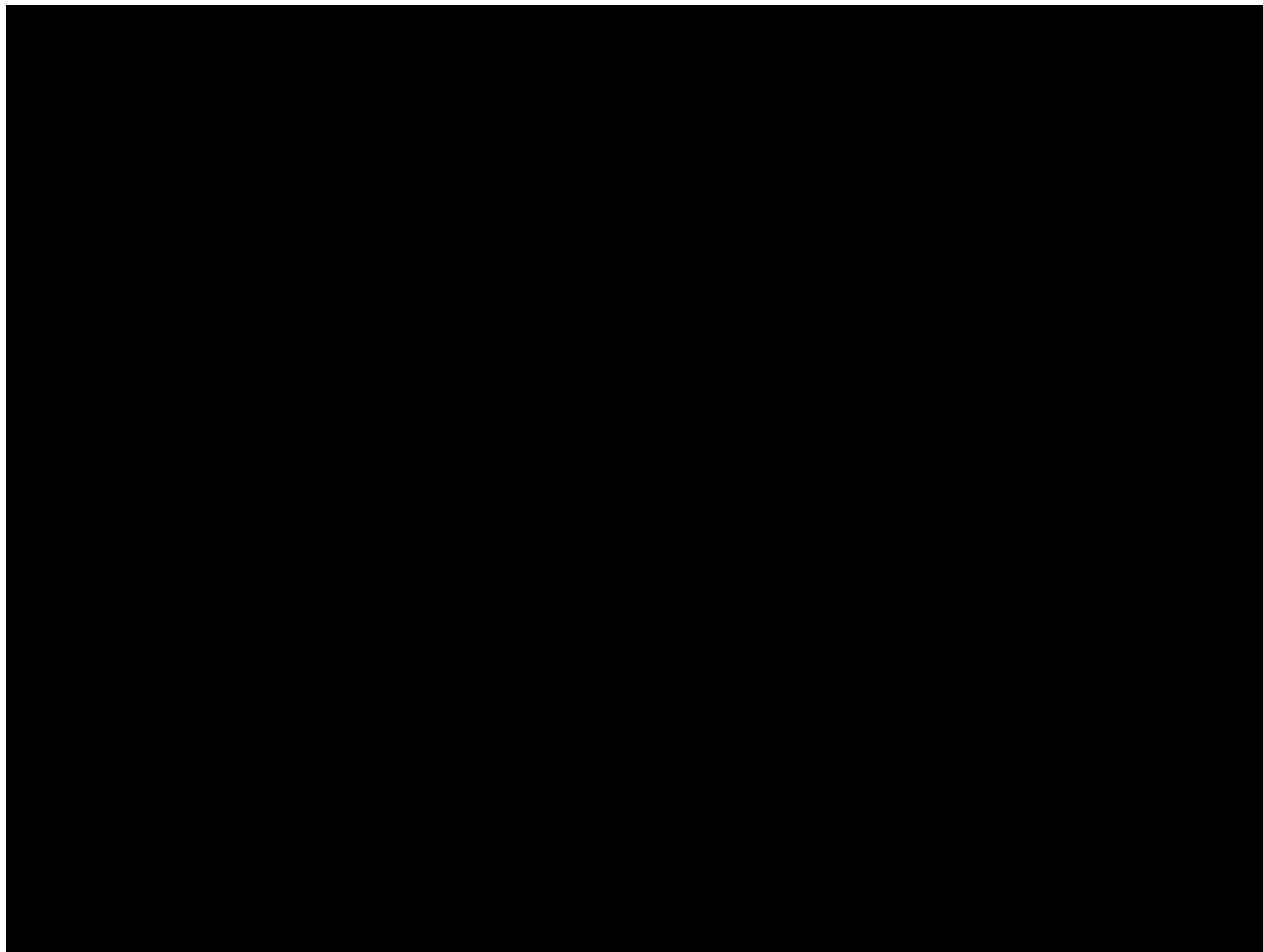


**Delivered stillborn male calf after 3 hours, 169 lbs**

SAN DIEGO ZOO.

**SAFARI PARK**

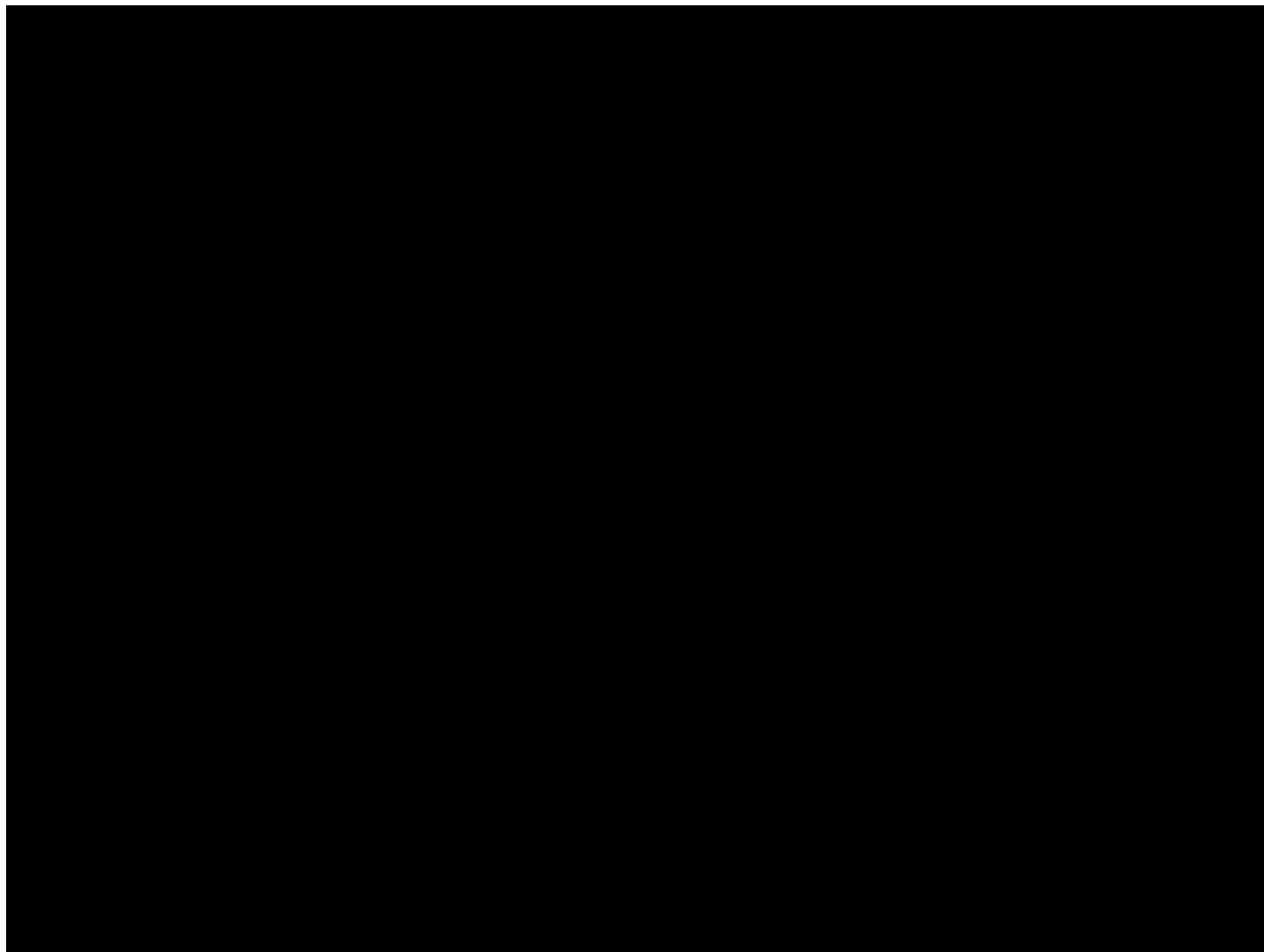
**Asha March 2012**



SAN DIEGO ZOO.

**SAFARI PARK**

**Asha March 2012**



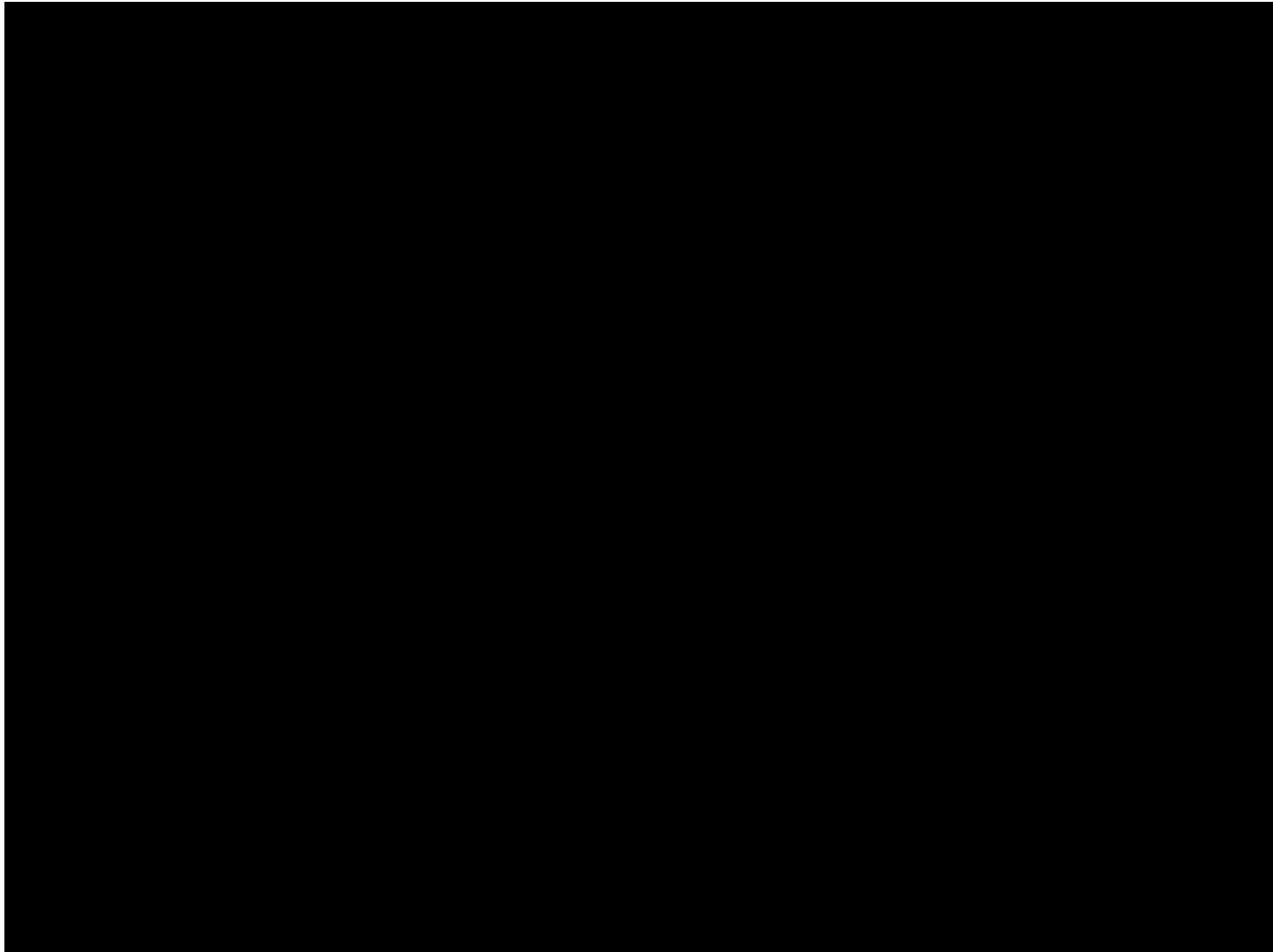


SAN DIEGO ZOO.

**SAFARI PARK**

**Kaya January 2013**

**Stillborn, posterior, sac ruptured**



SAN DIEGO ZOO.

# SAFARI PARK

## Kaya's stillborn January 6, 2013

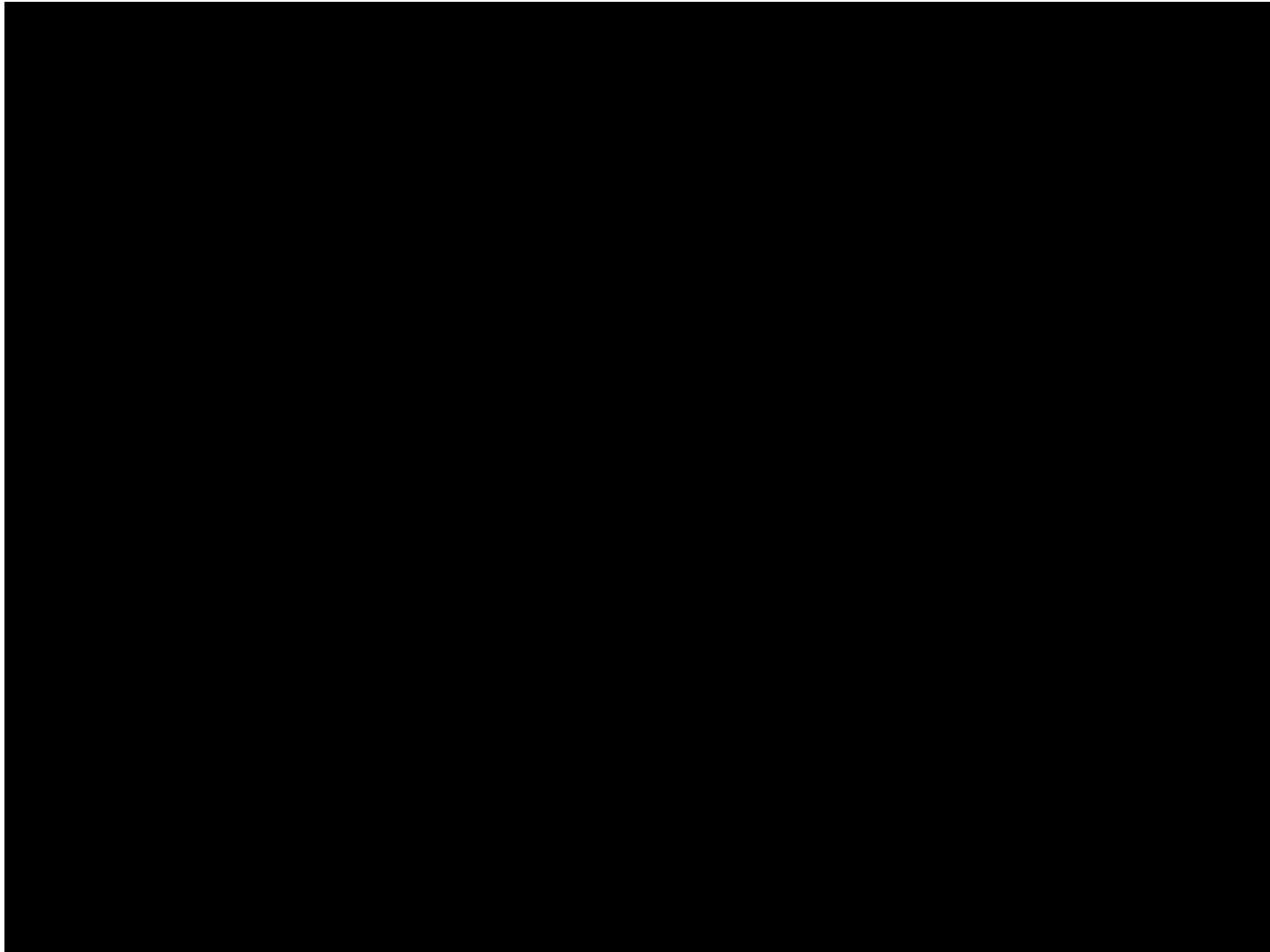


Delivered stillborn male calf after at least 50 minutes

SAN DIEGO ZOO.

**SAFARI PARK**

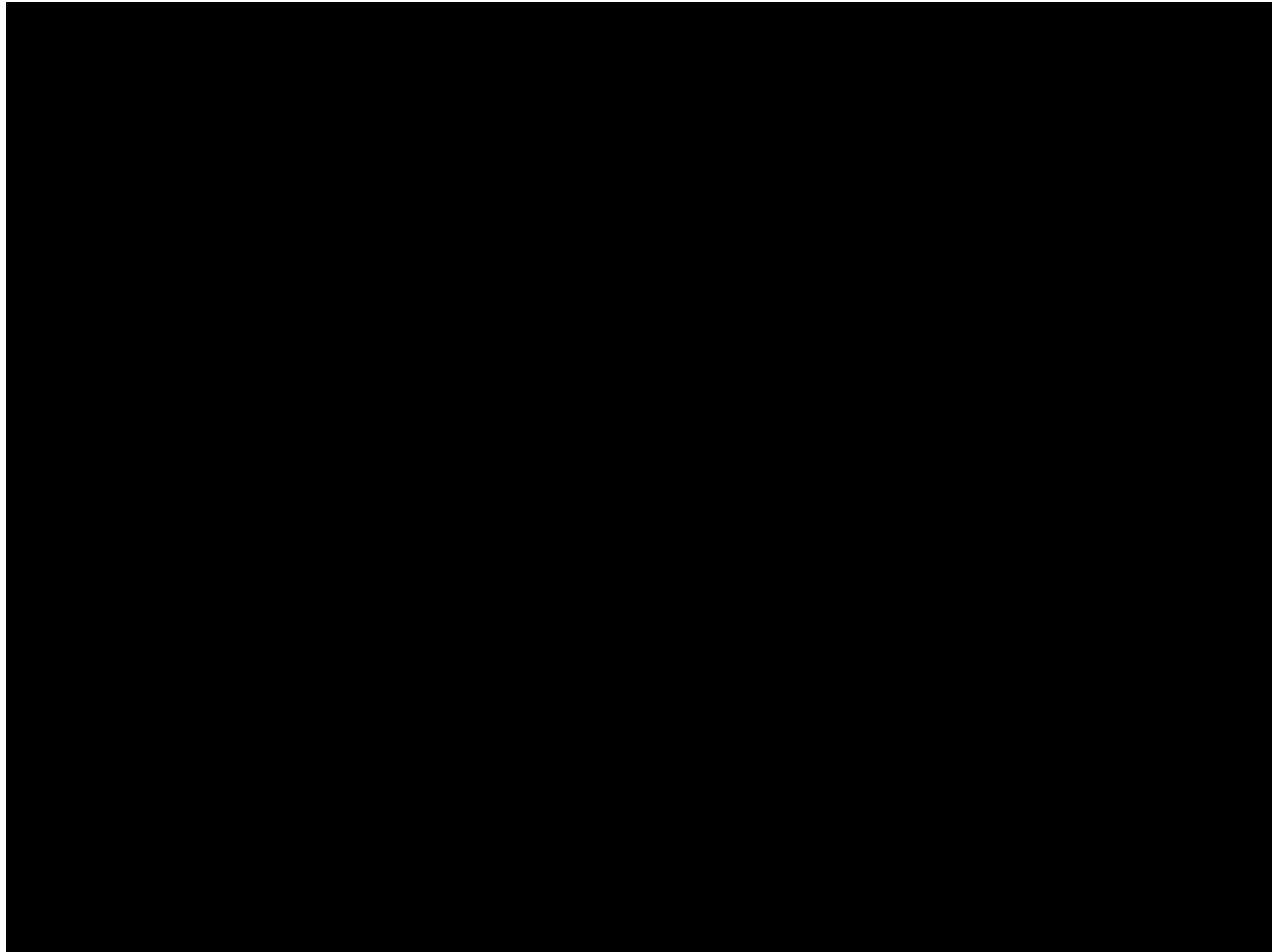
**Gainda 1997 stillborn**



SAN DIEGO ZOO.

**SAFARI PARK**

# Gainda-excessive fluid release

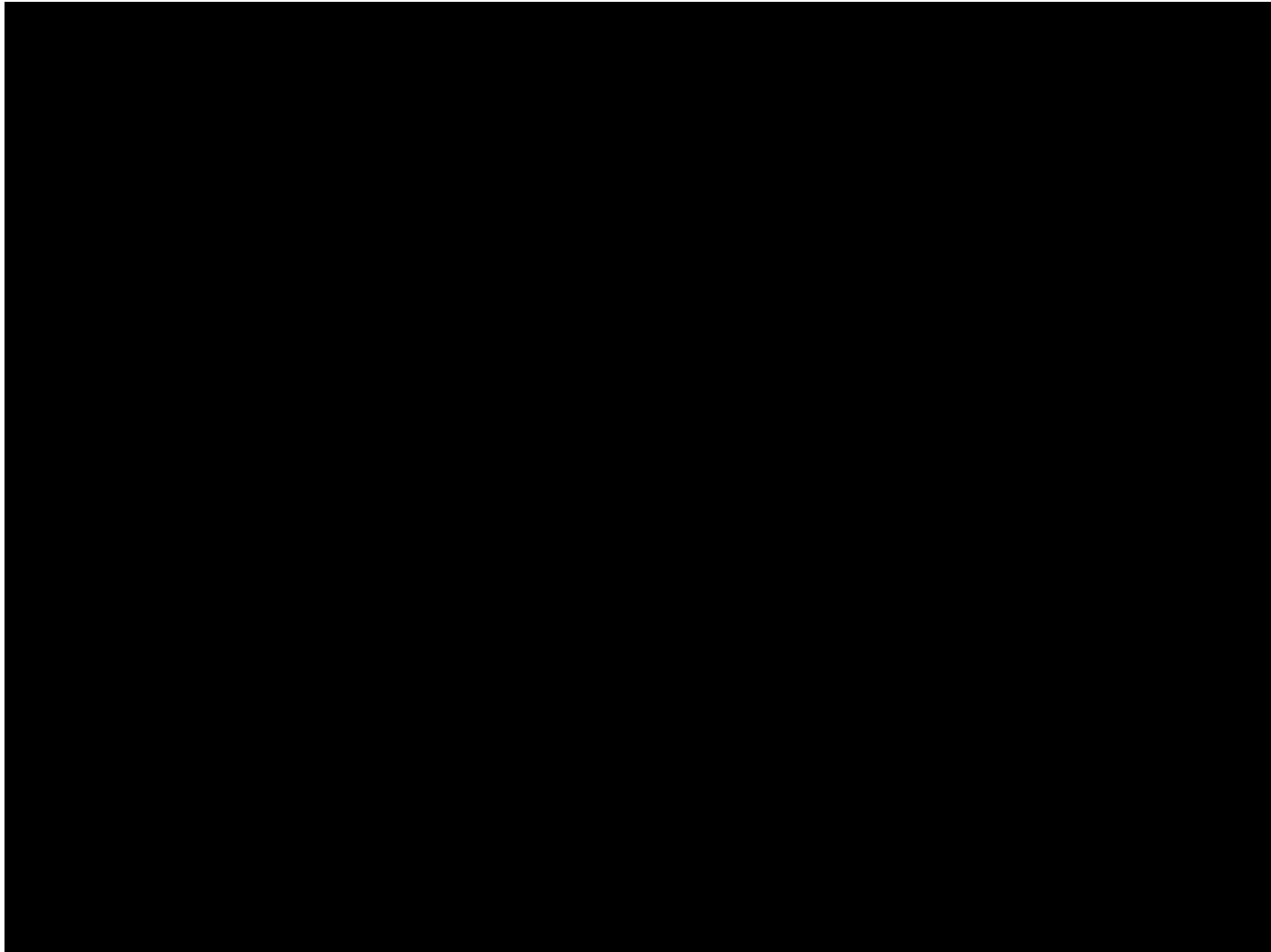


SAN DIEGO ZOO.

**SAFARI PARK**

**Gainda 1997**

**UNK, stillborn, sac ruptured?**



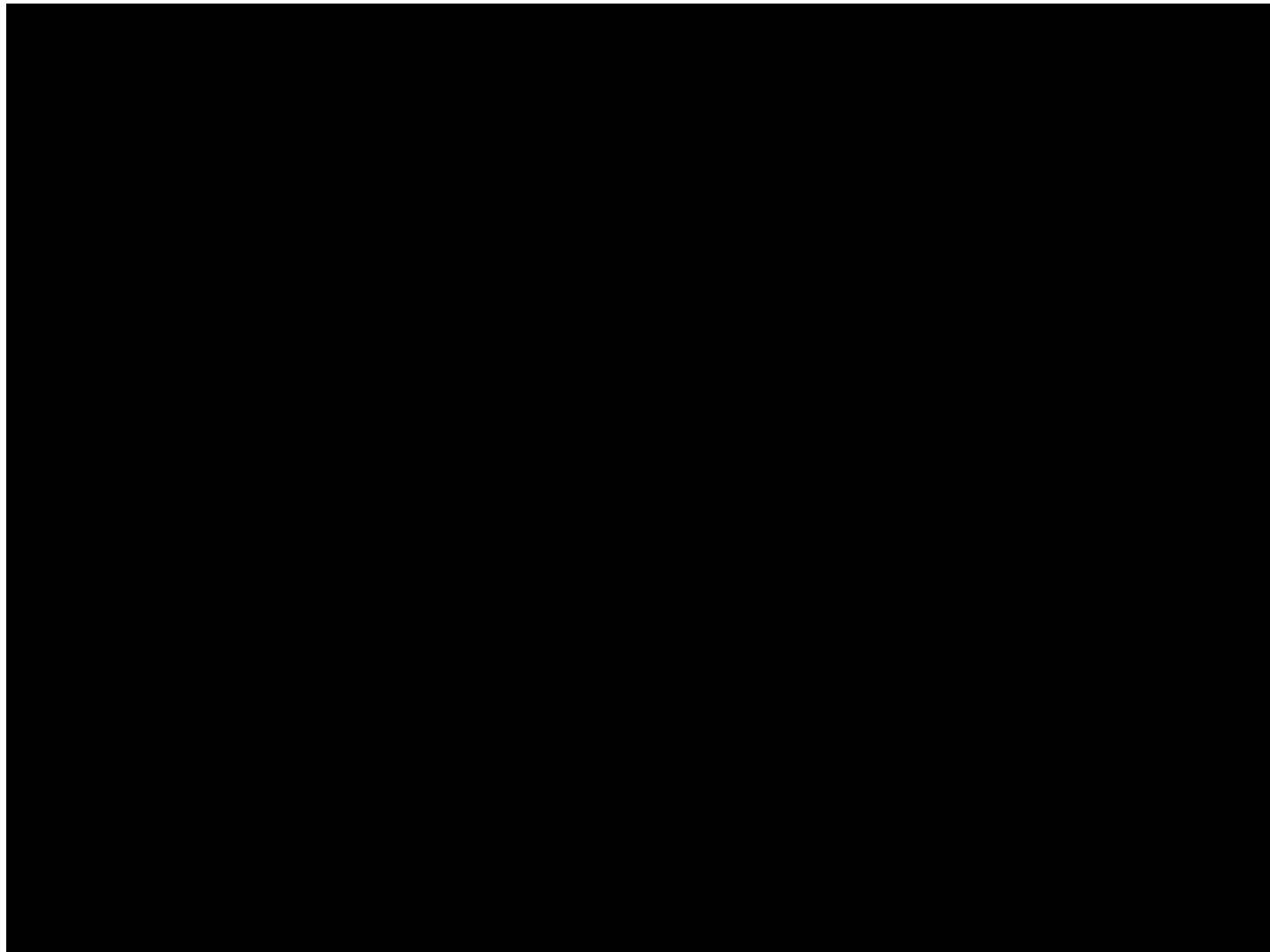


SAN DIEGO ZOO.

**SAFARI PARK**

**Gainda**

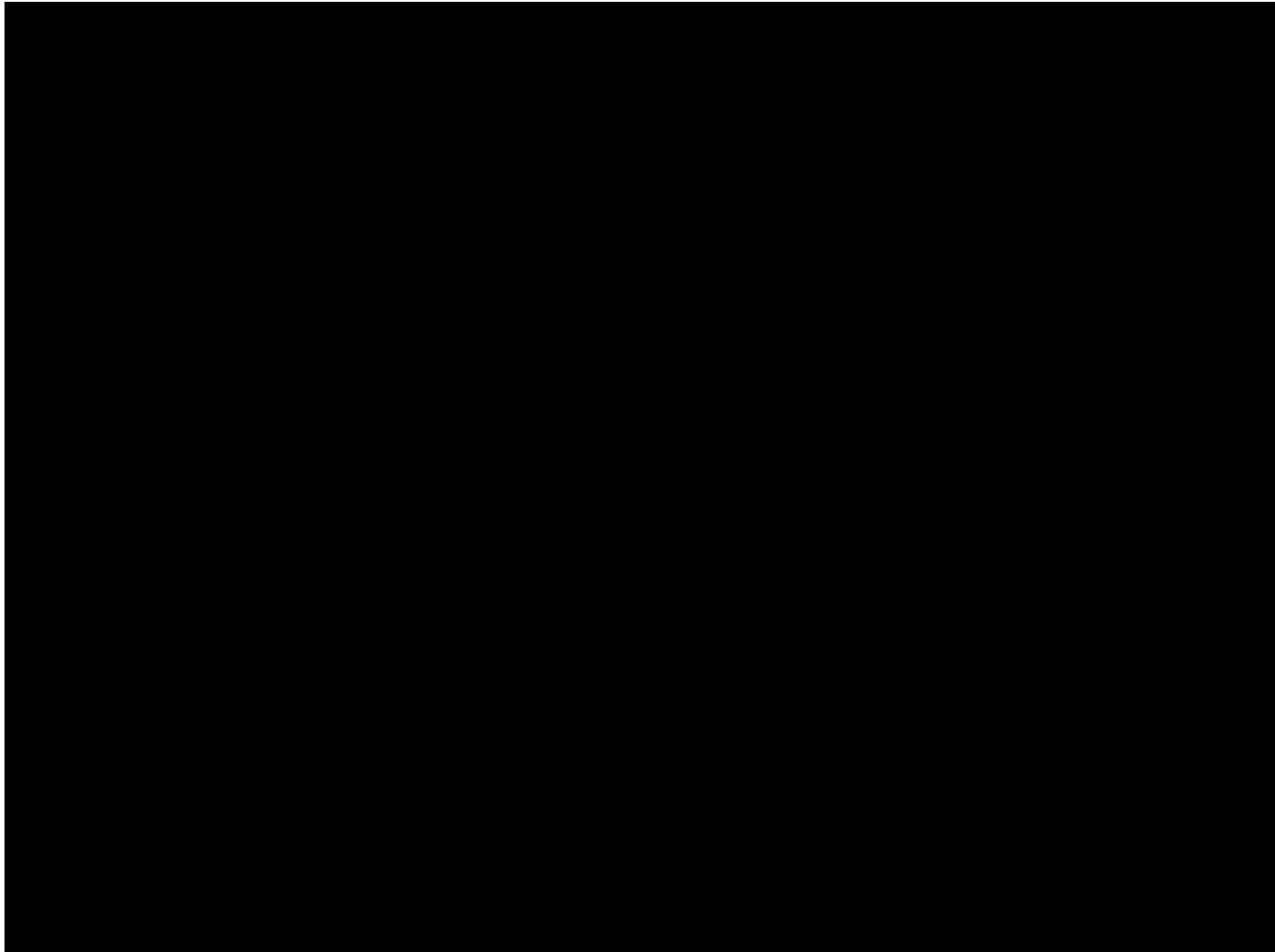
**posterior? sac rupture?**



SAN DIEGO ZOO.

**SAFARI PARK**

**Unknown Dam 1980's  
anterior, live birth, sac intact**

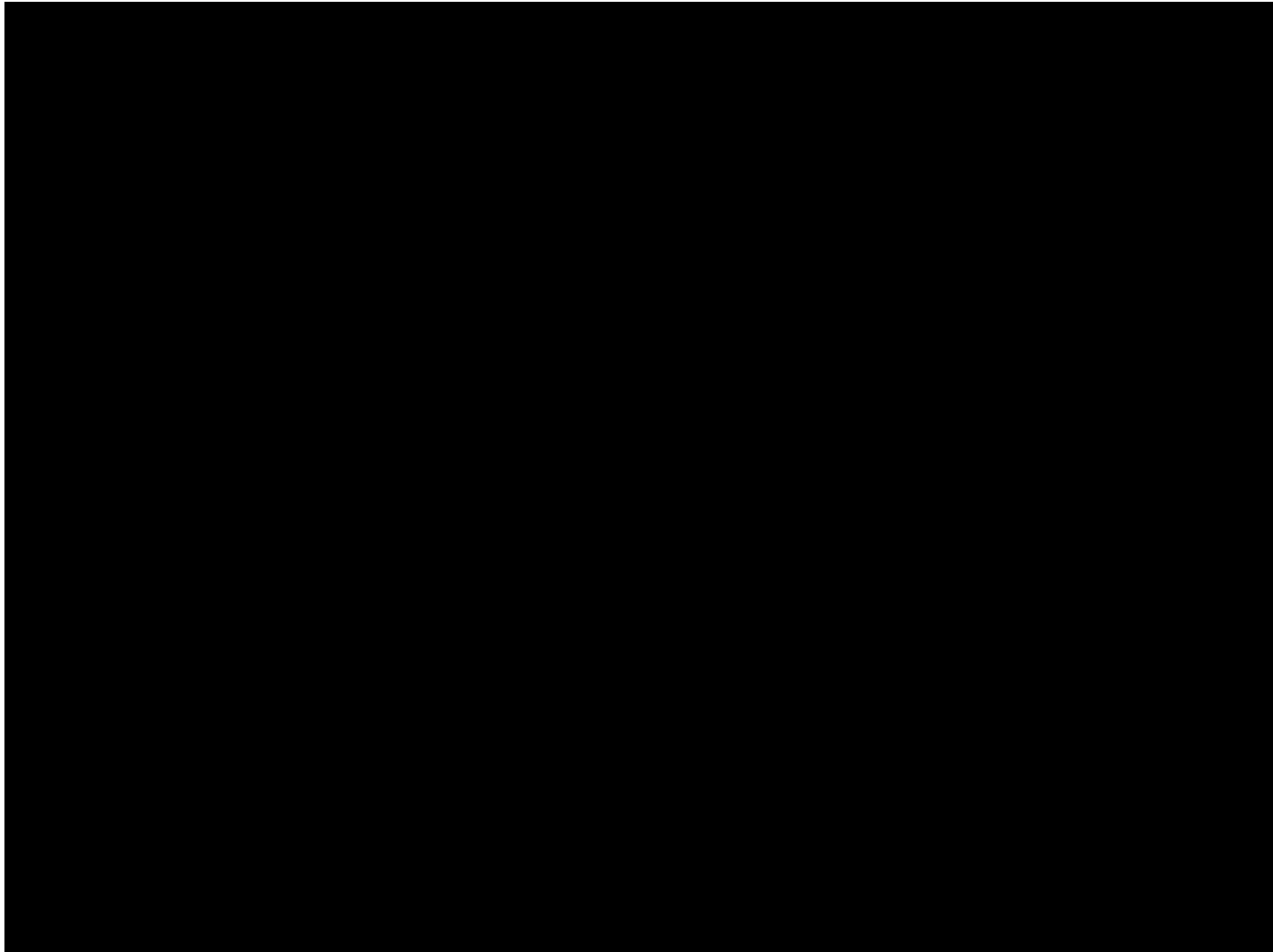


SAN DIEGO ZOO.

**SAFARI PARK**

**Jumia 13 March 1994**

**anterior, live birth, sac intact**

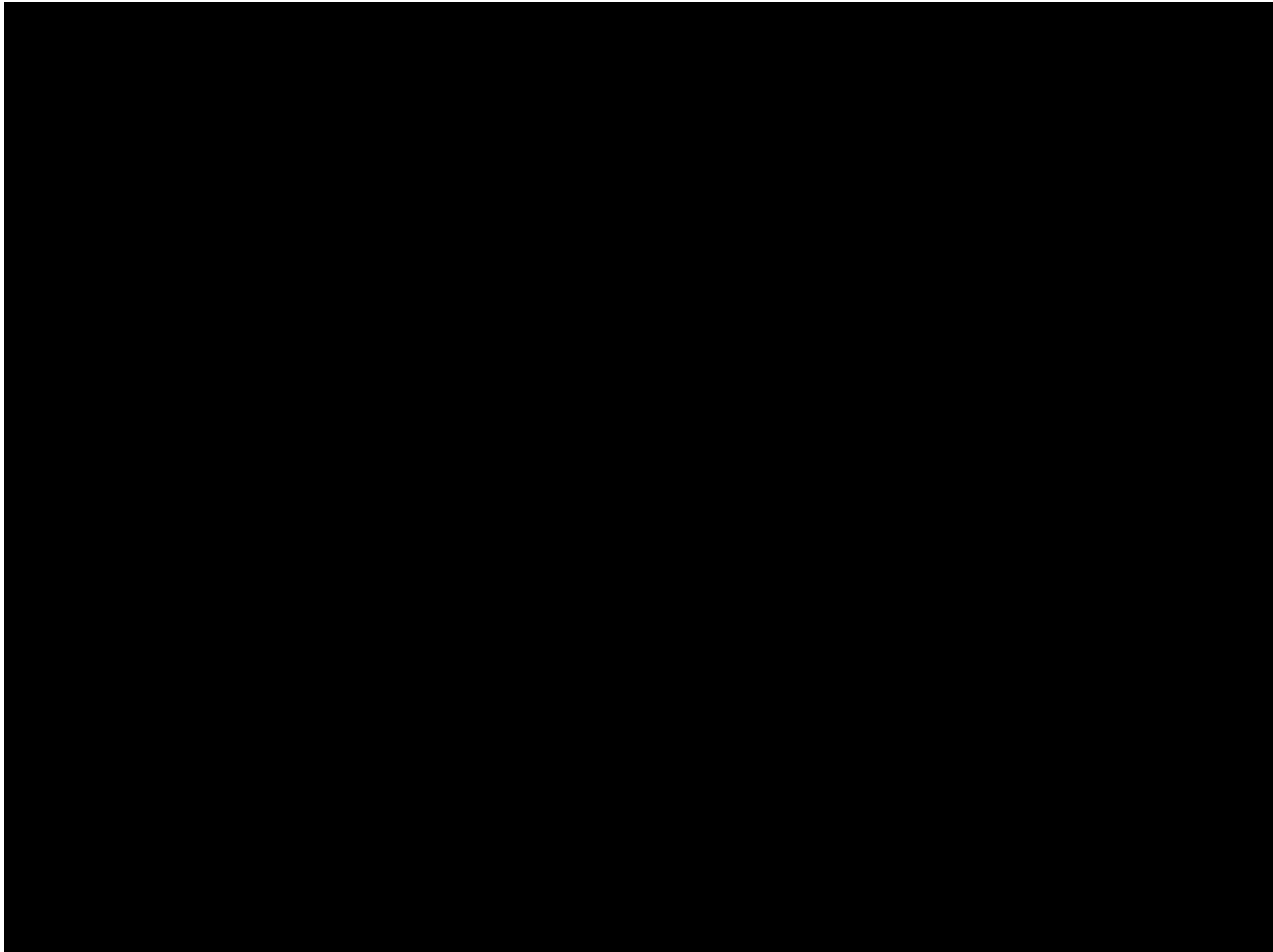


SAN DIEGO ZOO.

**SAFARI PARK**

**Jumia 4 Jan 1996**

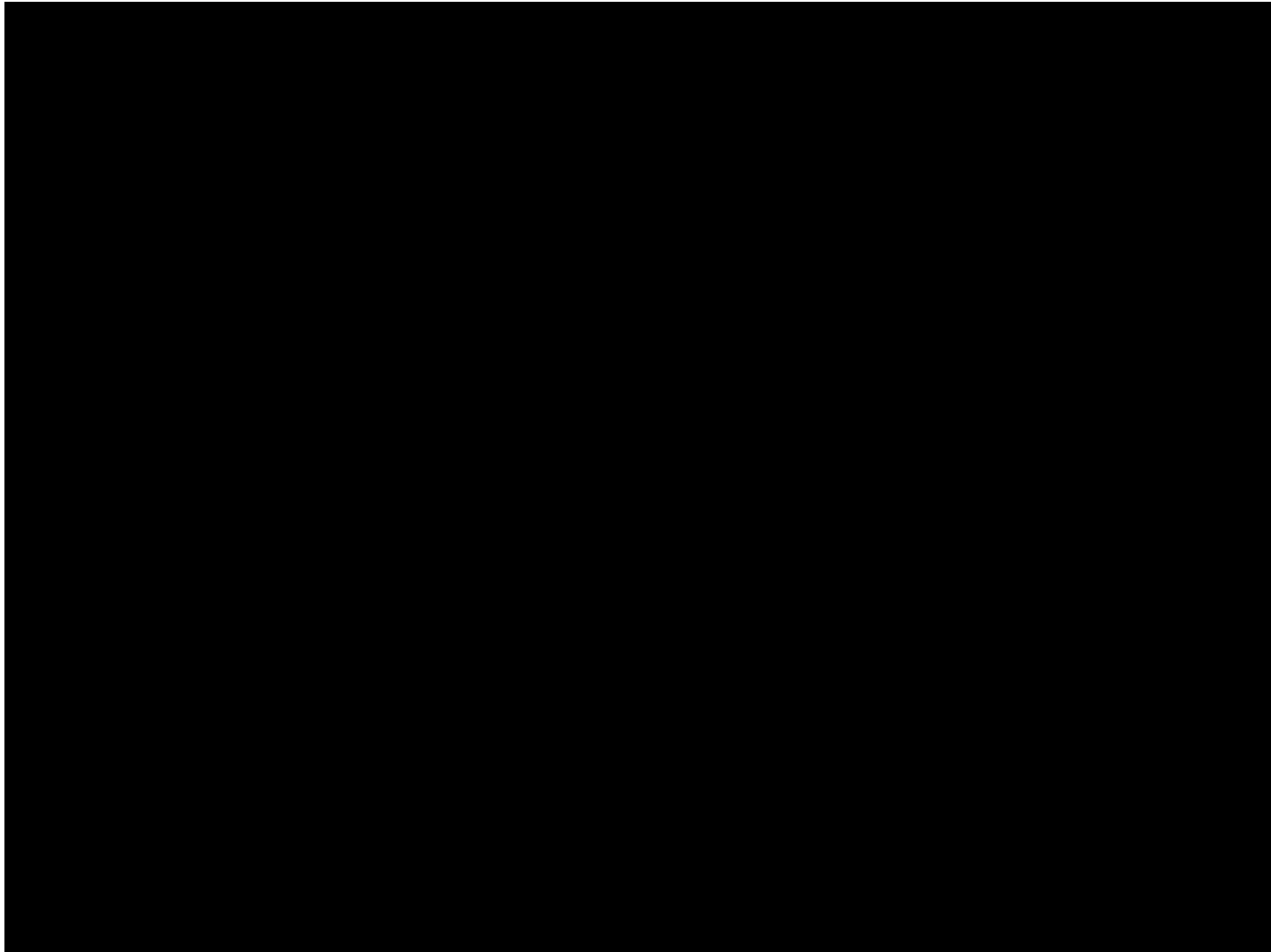
**anterior, live birth, sac intact**



SAN DIEGO ZOO.

**SAFARI PARK**

**Alta Jan 20 , 2012**  
**anterior, live birth, sac intact**



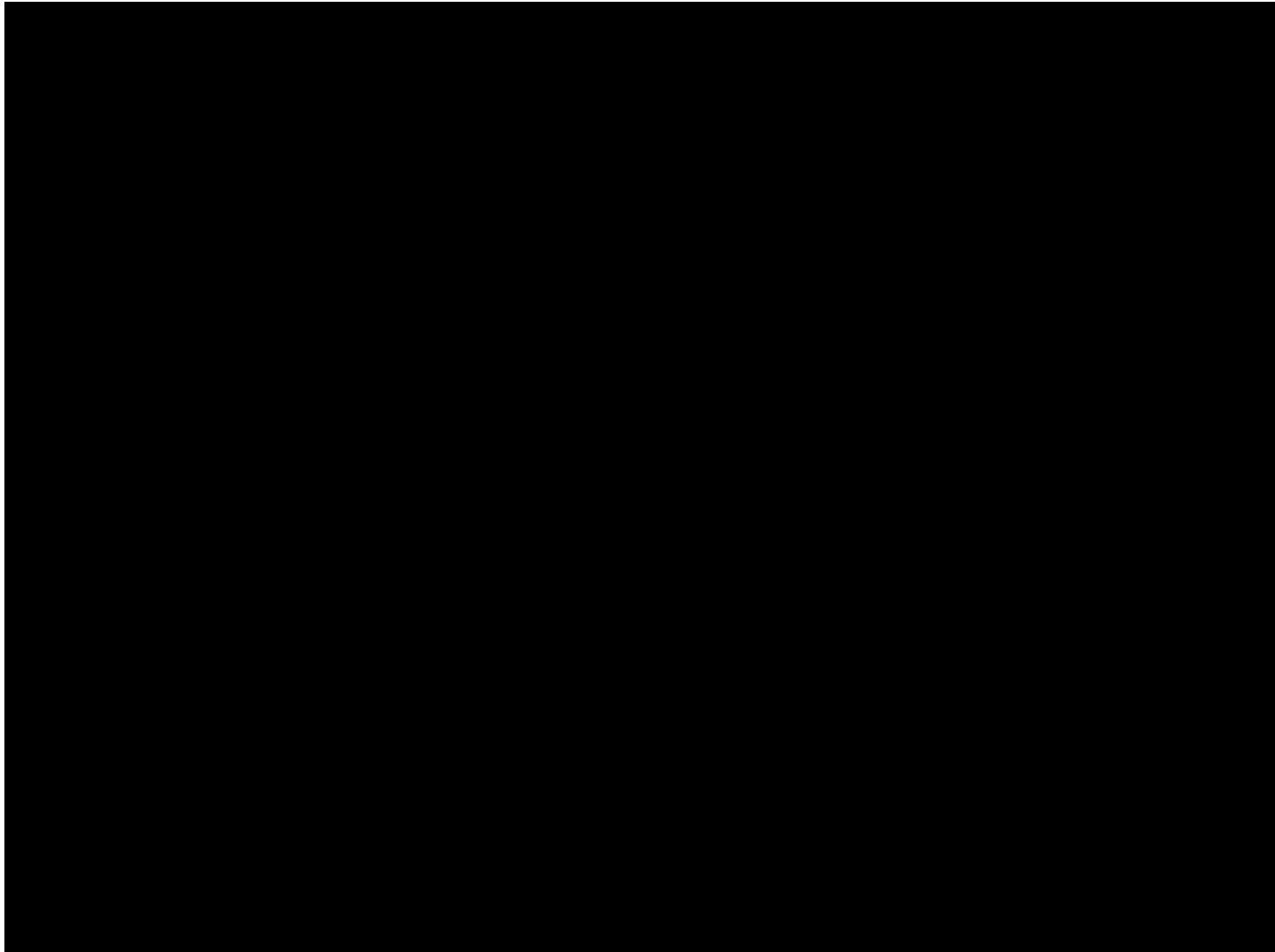


SAN DIEGO ZOO.

**SAFARI PARK**

**Netherlands GOHR-2008**

**anterior, live birth, sac intact**

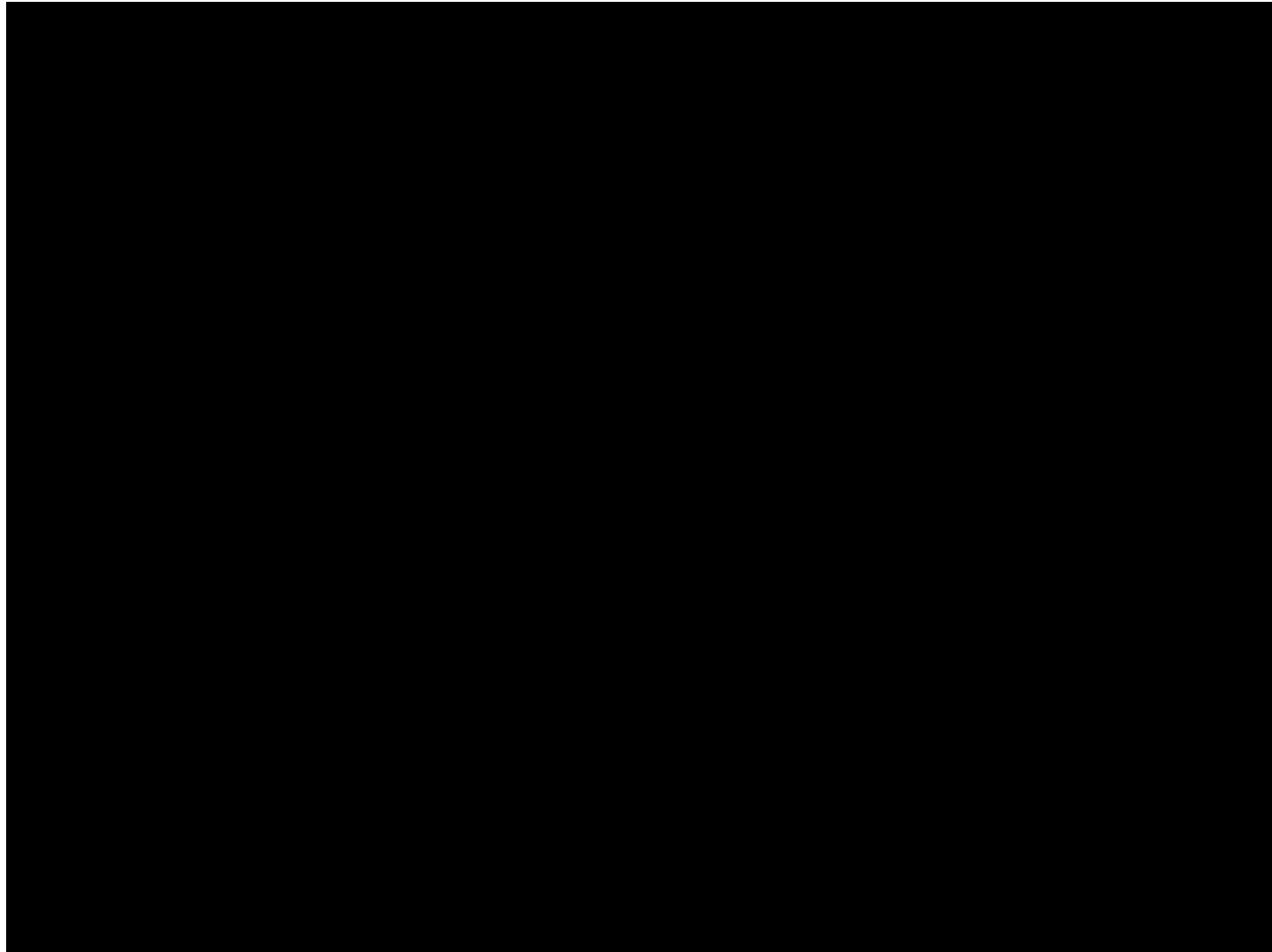


SAN DIEGO ZOO.

**SAFARI PARK**

**Netherlands GOHR 2011**

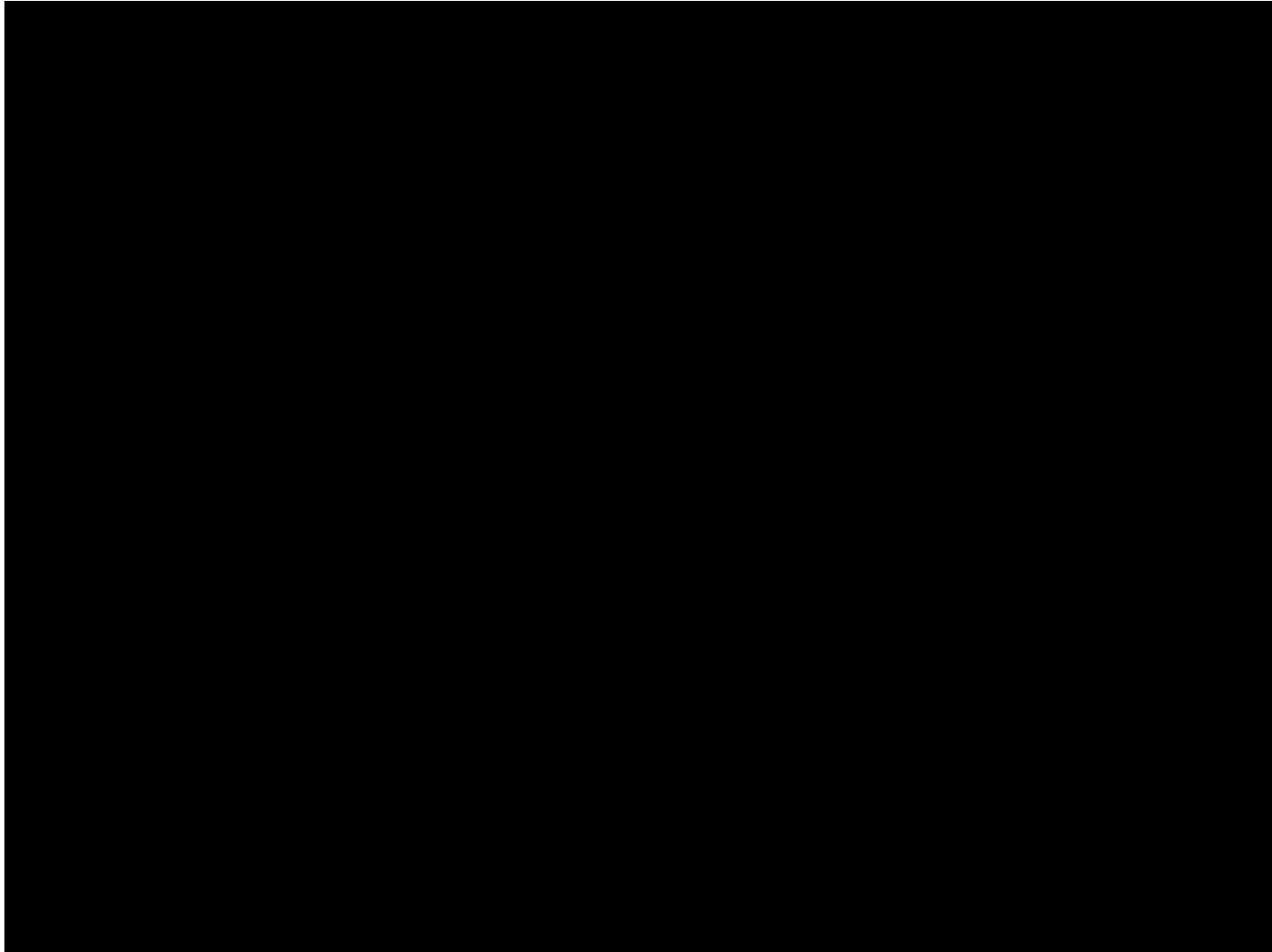
**posterior, live birth, sac intact**



SAN DIEGO ZOO.

**SAFARI PARK**

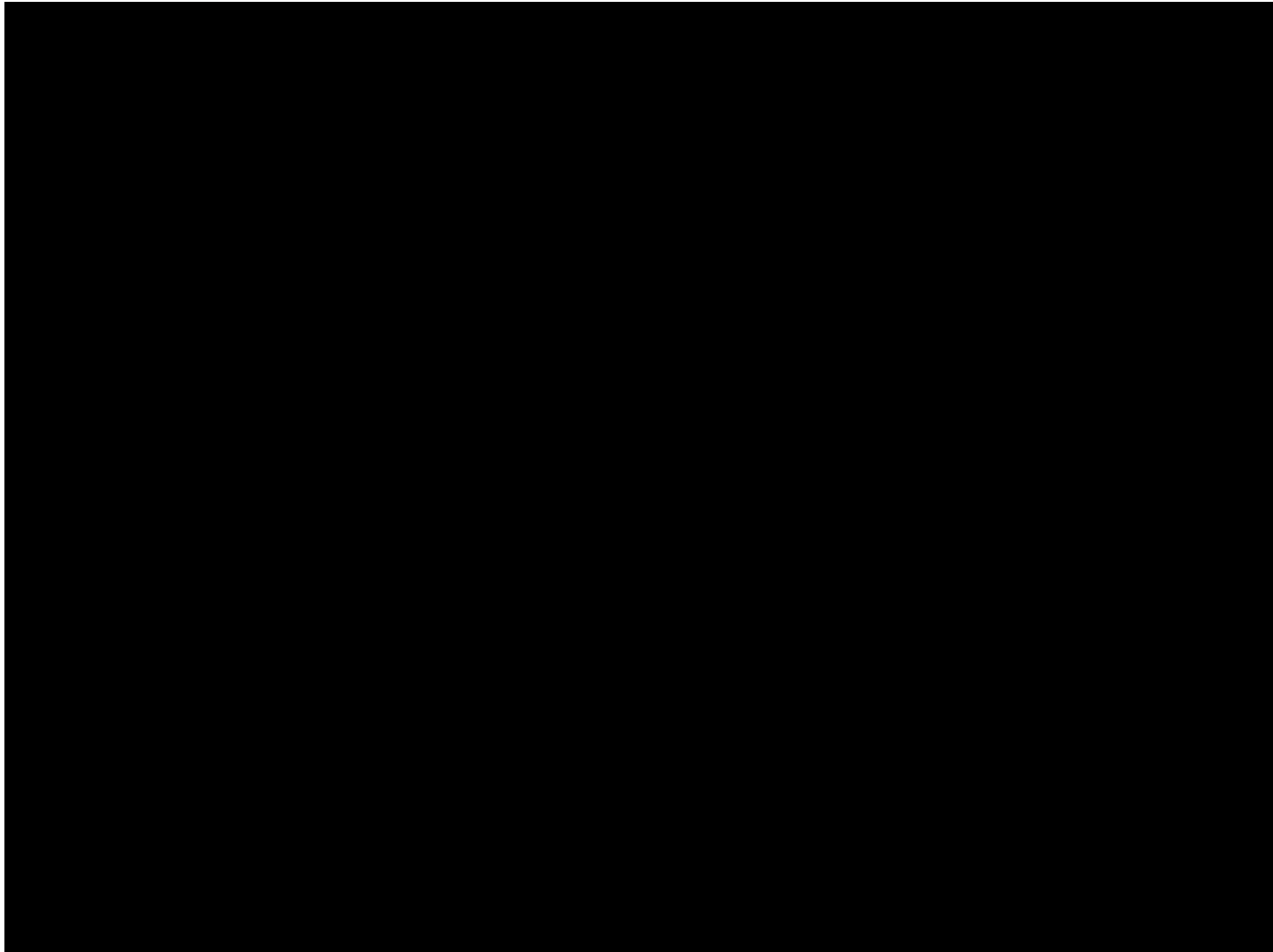
**Netherlands GOHR 2012**  
**posterior, live birth, sac intact**



SAN DIEGO ZOO.

**SAFARI PARK**

# Sumatran Rhino Cincinnati

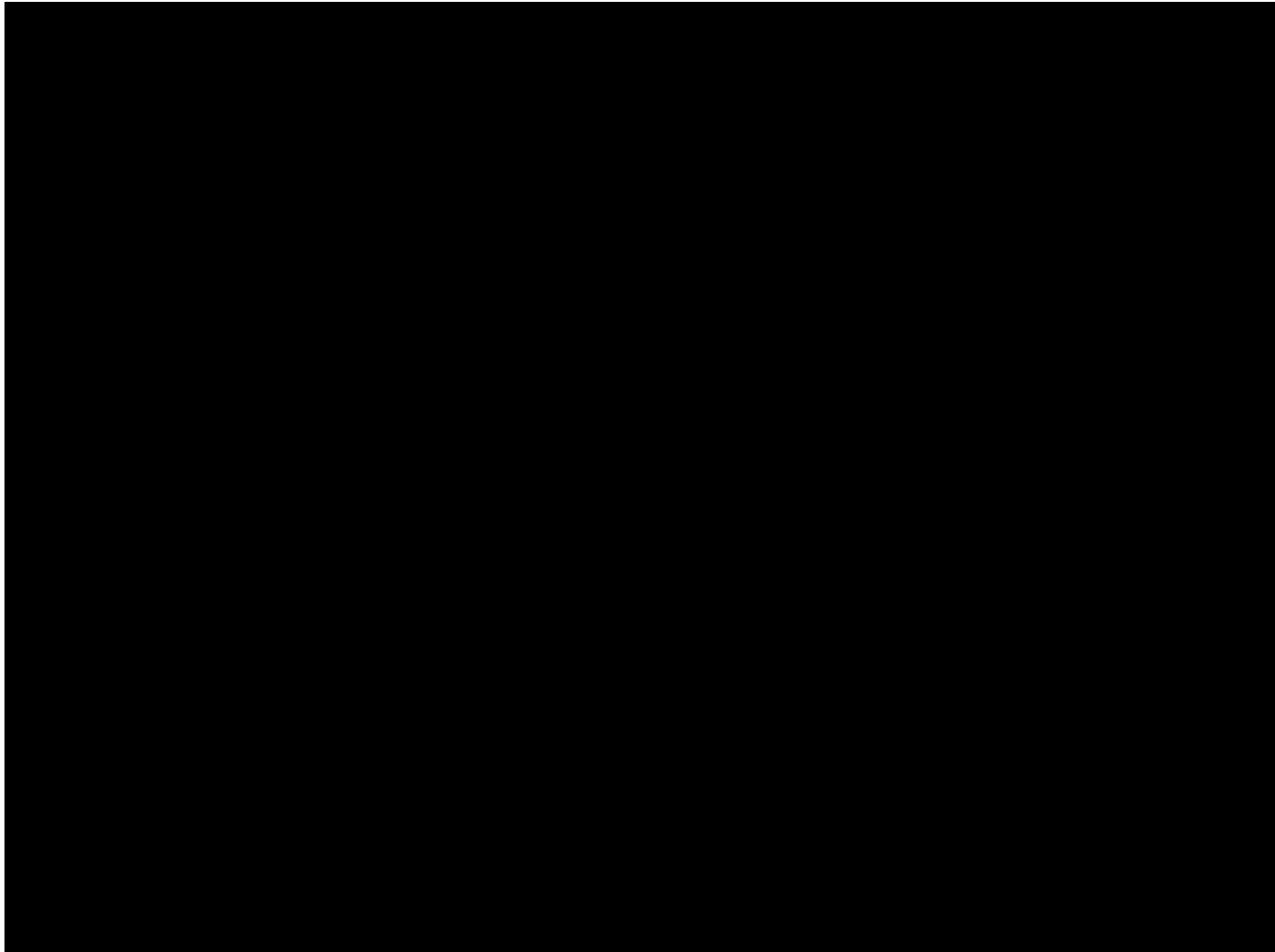


SAN DIEGO ZOO.

**SAFARI PARK**

**SDZSP SWR Ujima**

**posterior, live birth, sac intact**

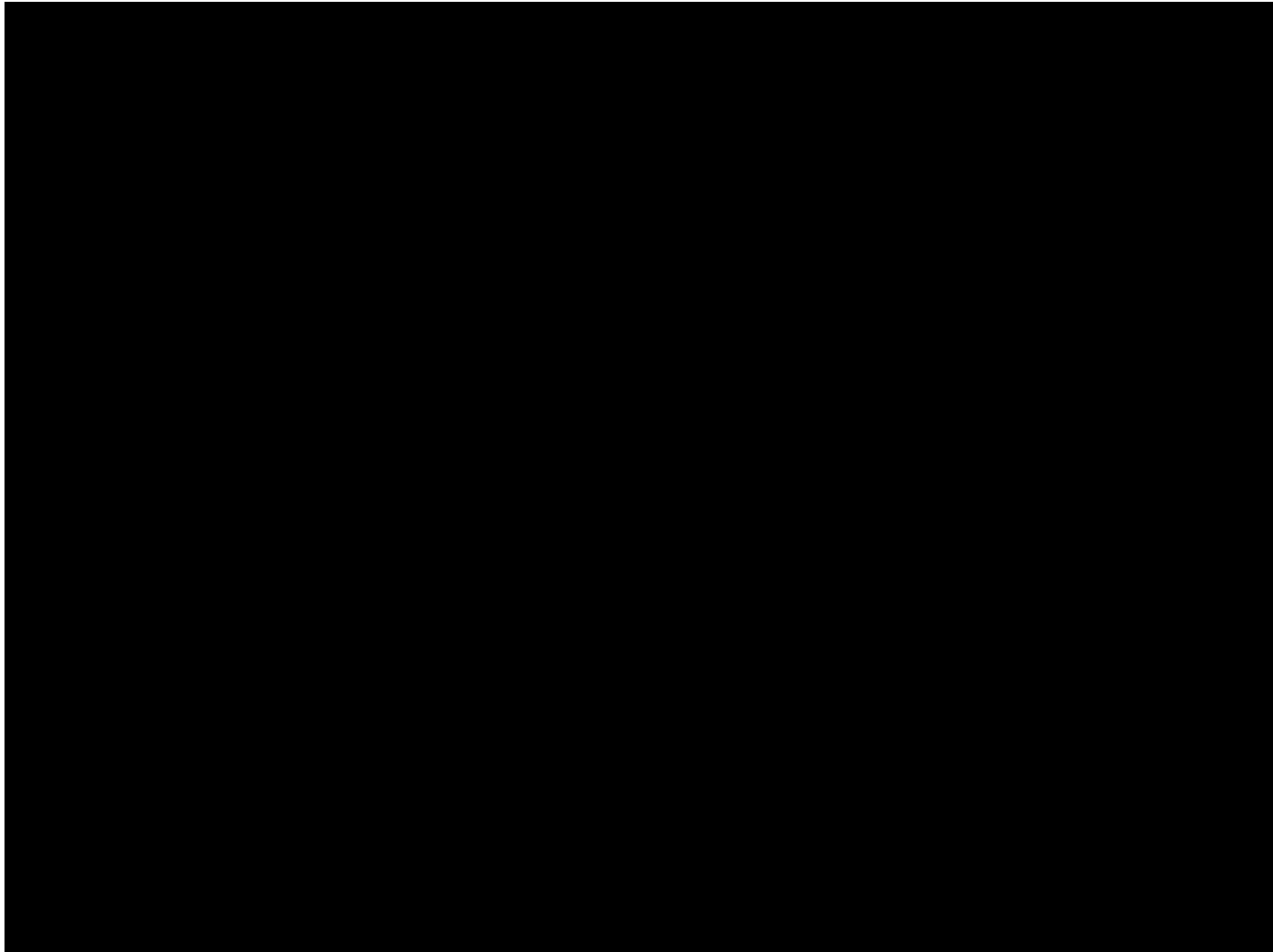




SAN DIEGO ZOO.

**SAFARI PARK**

**SDZSP SWR Kacy**  
**anterior, live birth, sac intact**

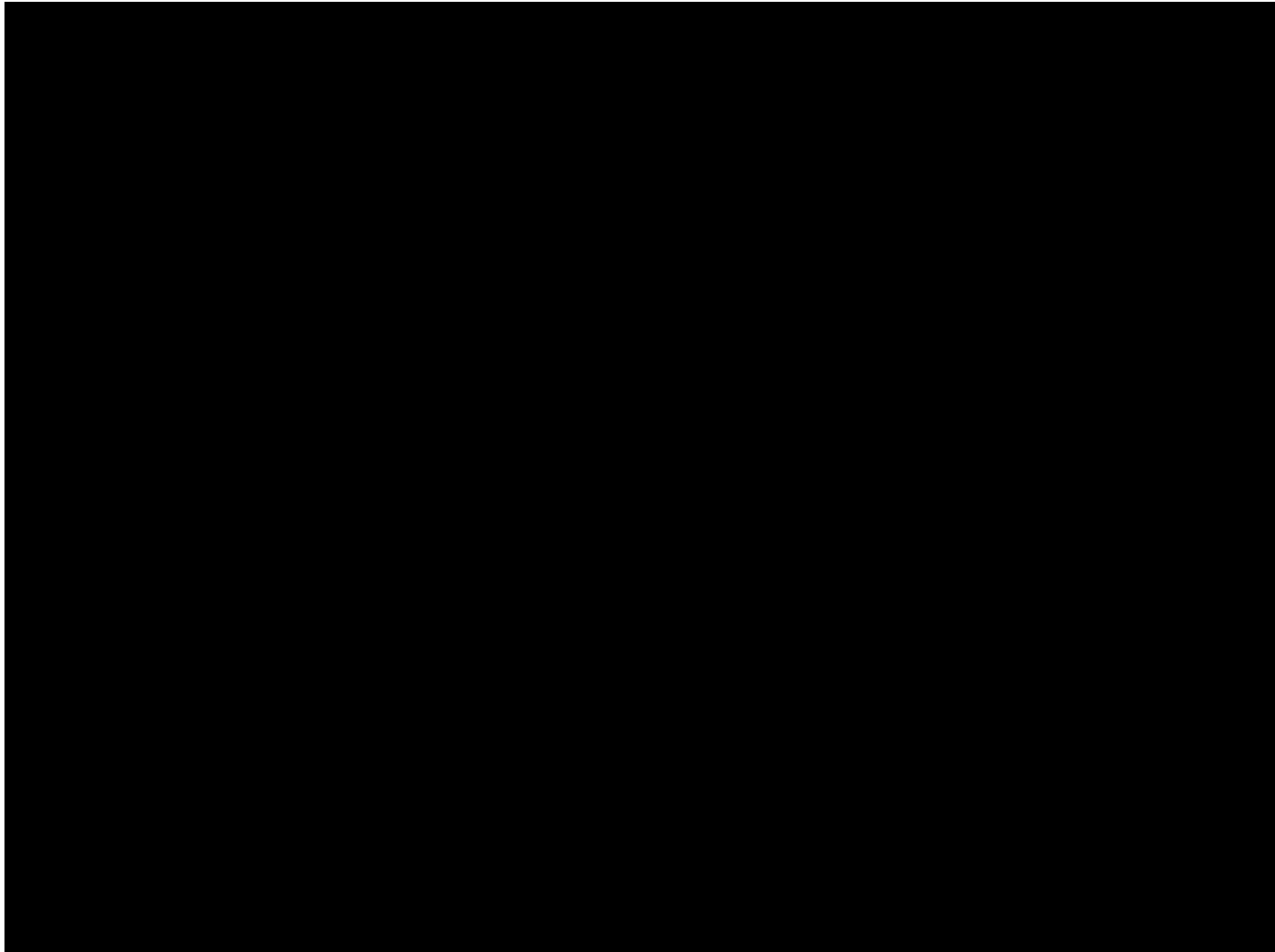


SAN DIEGO ZOO.

**SAFARI PARK**

**German SWR**

**anterior, live birth, sac intact**

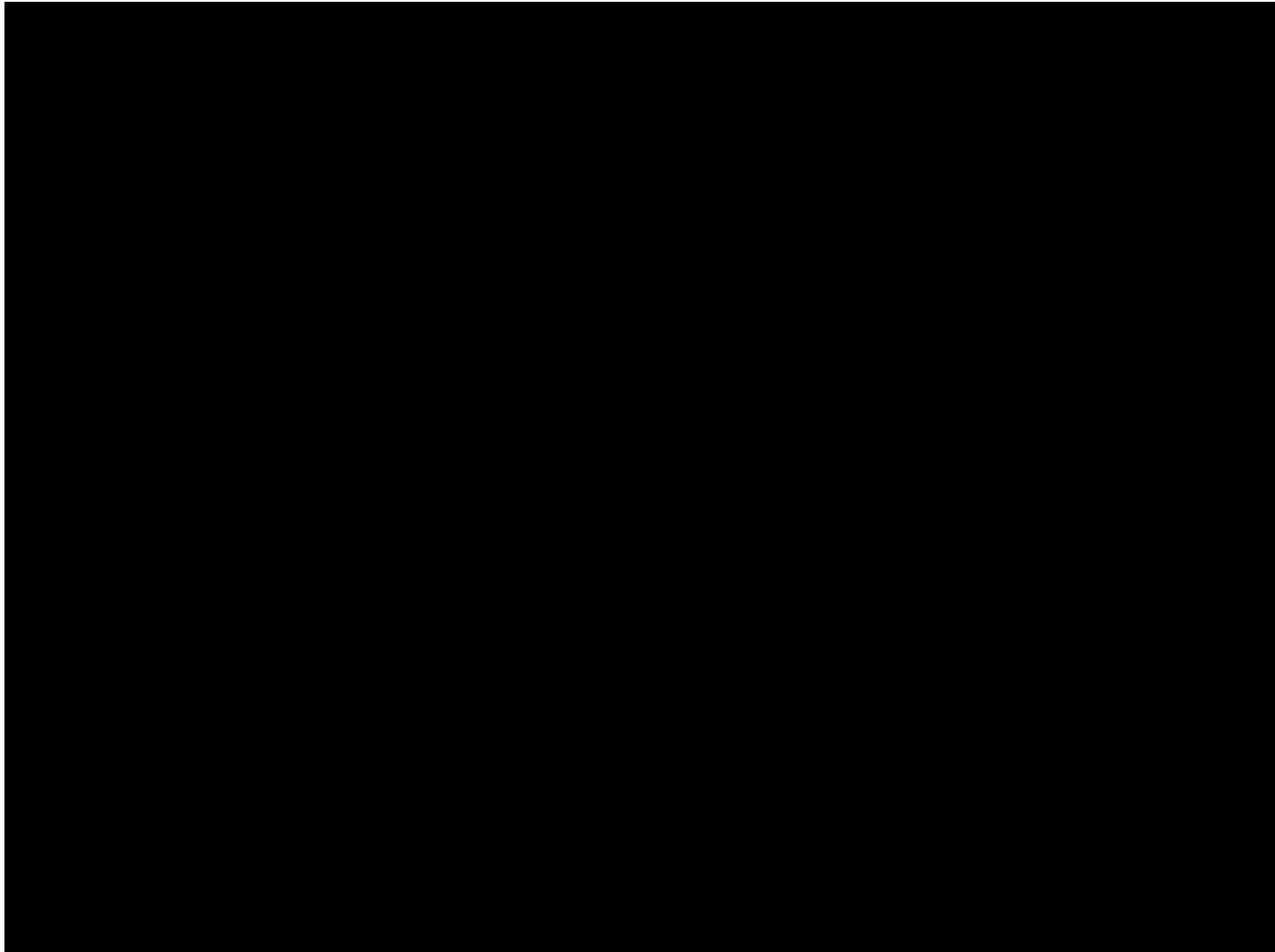


SAN DIEGO ZOO.

**SAFARI PARK**

**Taipei SWR**

**posterior, live birth, sac intact**

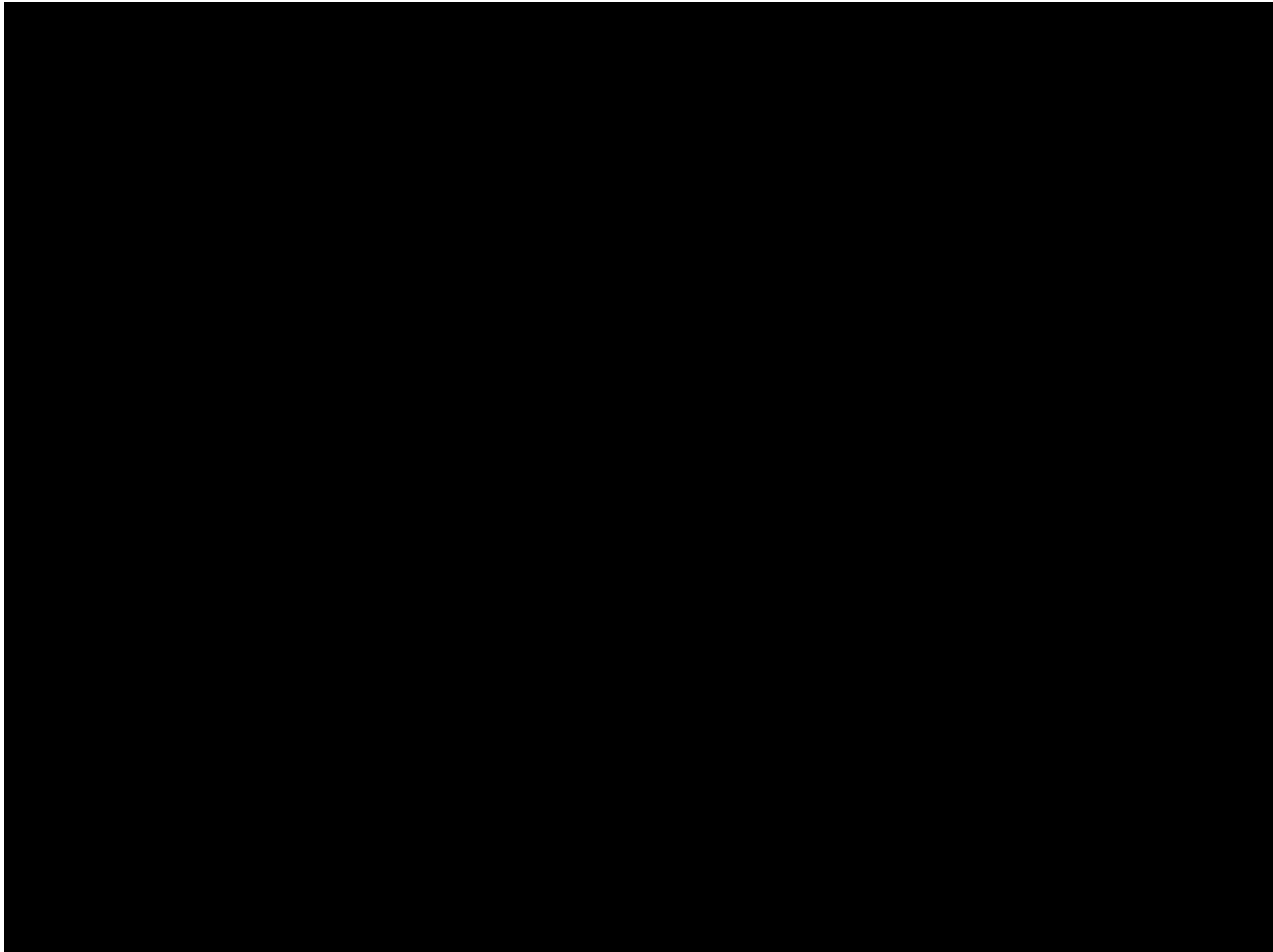


SAN DIEGO ZOO.

**SAFARI PARK**

**Israeli Rhino**

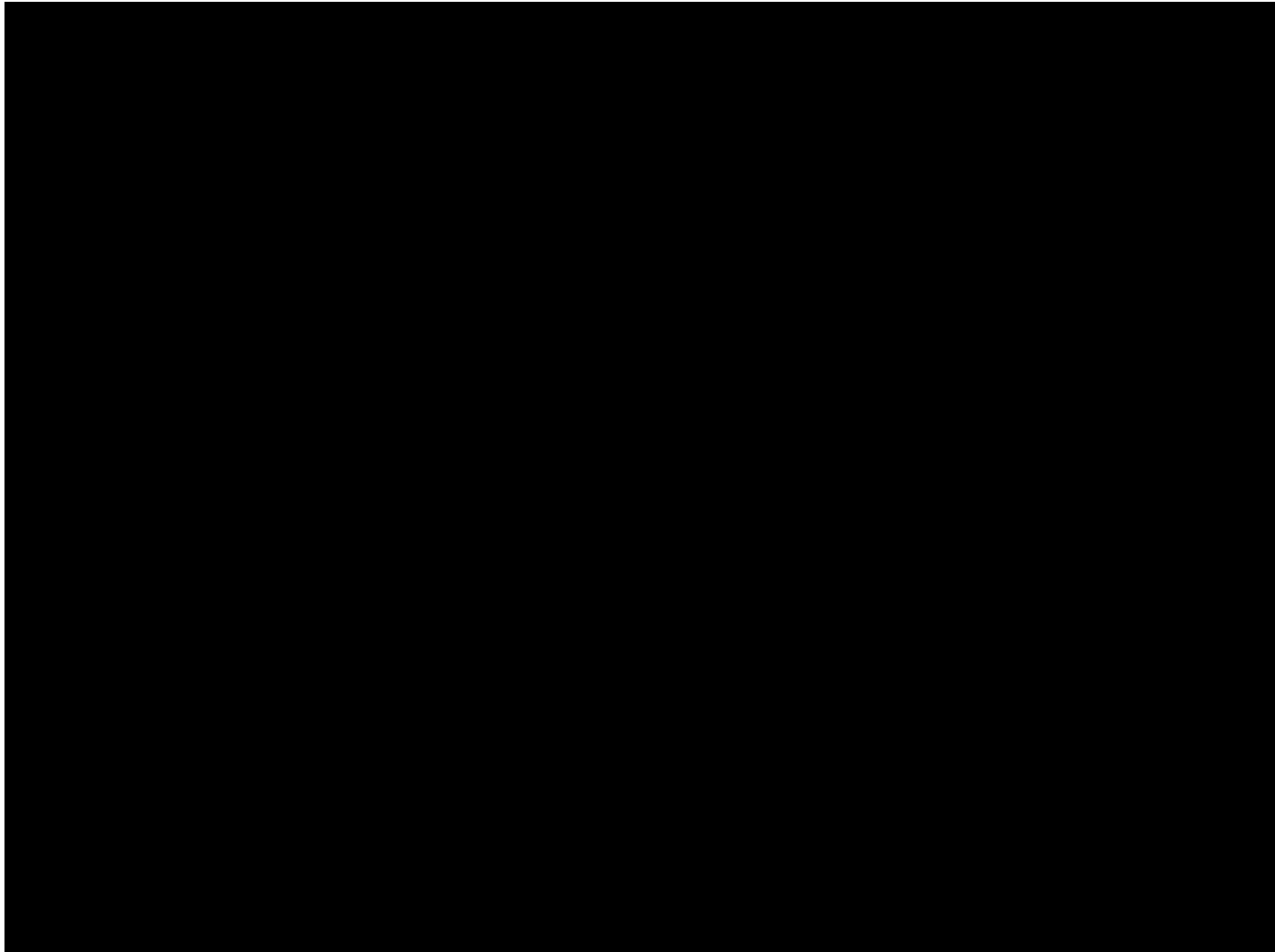
**anterior, live birth, sac intact**



SAN DIEGO ZOO.

**SAFARI PARK**

**German Black Rhino  
anterior, live birth, sac intact**

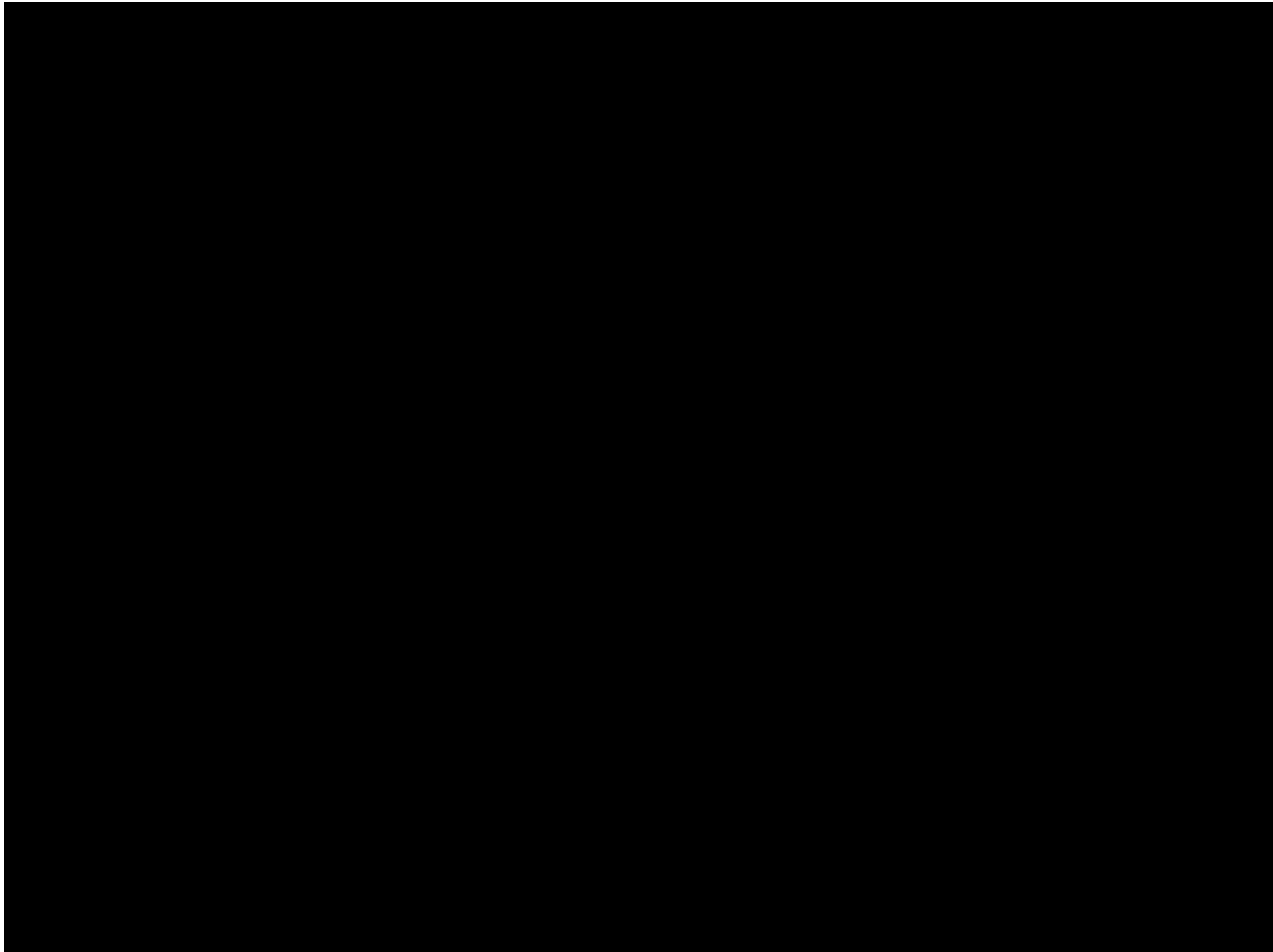




SAN DIEGO ZOO.

**SAFARI PARK**

**SZDSP Black Rhino Jeri  
posterior, sac ruptured, live birth**



SAN DIEGO ZOO.

# SAFARI PARK

## Chester Zoo Kitani's Births



**Asani**  
**Male**  
**Born: 29/10/08**



**Breech birth**  
**Male**  
**Born: 06/07/12**

SAN DIEGO ZOO.

# SAFARI PARK

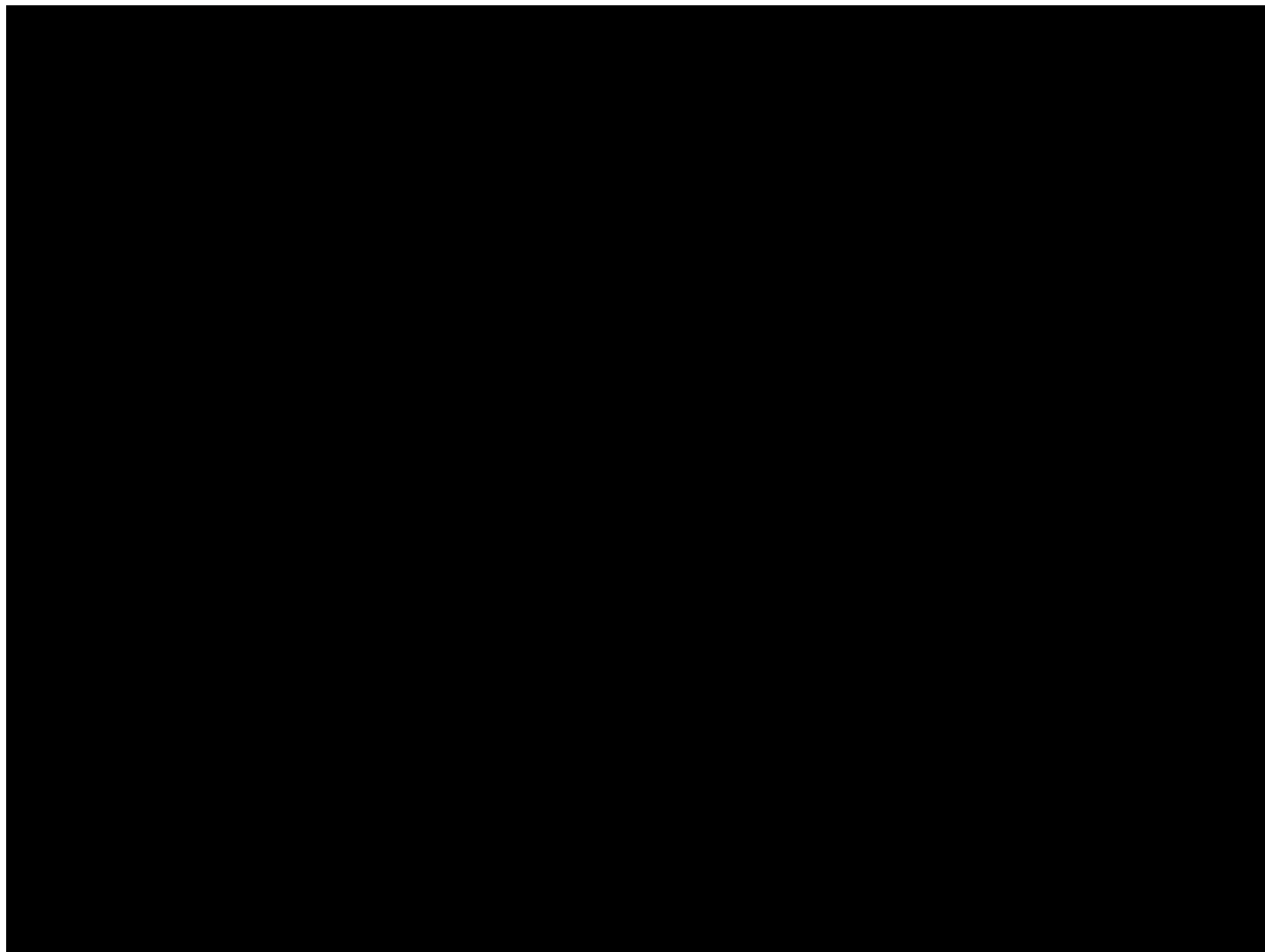
## Chester Zoo Chanua's Birth (calving pen)



SAN DIEGO ZOO.

**SAFARI PARK**

**Andatu**



# Combined Rhino Birthing Video Data

## SWR-7

4 anterior, 2 posterior,  
1-UNK

All live births, sac intact

### Black rhinos-5

2 anterior, 3 posterior

4 live births

1 Posterior had sac  
rupture

1 posterior dystocia  
stillbirth

### Sumatran-3

1 anterior, 2 posterior

All live births

- **GOHR births-14**

- 5 anterior, 8 posterior, 1-  
unconfirmed posterior

- 5 anterior, 4 posterior-live  
births, sac intact

- 4 posterior-stillbirths

- 1 suspected posterior  
stillbirth

## TOTAL-29 births

**13 anterior, 13 live birth**

**15 posterior, 10 live birth, 5 stillbirth**

**1 suspected posterior stillbirth**

# Combined Rhino Birthing Data

## **SWR-7**

4 anterior, 2 posterior,

1 unk

All live births

## **Black rhinos-5**

2 anterior, 3 posterior

4-live births

1-Posterior had sac

rupture ~15 minutes

1 posterior dystocia

stillbirth

## **GOHR births-21**

8 anterior, 7 live birth

1-dystocia stillbirth

**12** posterior, 8 live birth,

4 stillbirths

**1** suspected posterior  
stillbirth

## **Sumatran-3**

1 anterior, 2 posterior

All live births

# **Combined Rhino Birthing Data**

**TOTAL-36 births**

**15 anterior**

**14 live births, all sac intact**

**1 stillbirth, dystocia, fetotomy-SDZSP**

**19 posterior**

**12 live births**

**11 sac intact, 1 amniotic sac ruptured**

**6 stillbirths, all amniotic sac ruptured**

**1 born dead, dystocia, fetotomy-Chester**

**1 suspected posterior stillbirth**

**1 unk live birth (SWR video-Dublin)**



# **Relationships Among Birth Presentation, Amniotic Sac Rupture and Stillbirths in Rhinoceros**

**Birth presentation may be significant**

**All 5 videoed stillbirths posterior presentation**

**Amniotic sac rupture may be significant**

**All 7 stillbirths had sac rupture**

**(All but 1 live birth had sac intact)**

**More research is needed**

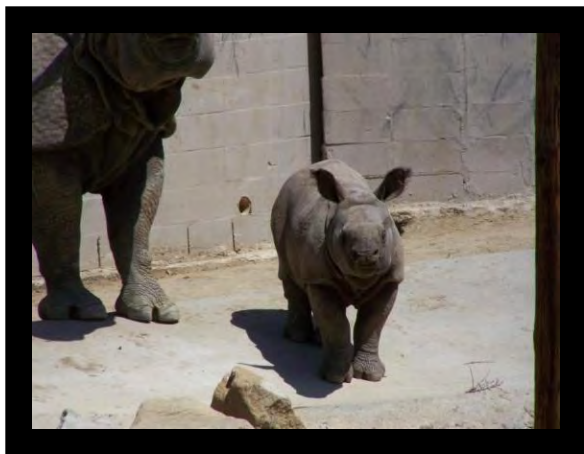
## What I need help with

- Collect more data on other rhino births
- Expand the collaborative team
- Further develop an accurate assessment plan of data
- When the members of an organization work together, important questions are answered
- We can answer this question!**

# Special Thanks to all of you and...



Mili and East Crew



Bandhu



Tanaya's calf who died at 5 days

- My Husband, Big Eddie
- East Crew, Best Crew Ever!
- San Diego Zoo Global Employees
- Collections, Husbandry and Sciences Department SDZSP
- Institute for Conservation Research
- Dr. Lance Miller
- Randy Rieches-Henshaw Curator, SDZSP
- Lance Aubery, SDZSP
- Andy Blue, SDZSP
- Chester Zoo-Mark Cleave, Tim Hamilton
- Cincinnati Zoo
- Dr. Terri Roth, Dr. Monica Stoop,
- Leah Winstead-Intern video observer
- Buffalo Zoo-Joe Hauser

**Ask the animals, they will teach you...JOB 12:7**

SAN DIEGO ZOO.

**SAFARI PARK**

**Why we do this**

