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**Case study** **OPEN ACCESS**

# Dystocia management and intensive neonatal care in a Sumatran rhinoceros at the Sumatran Rhino Sanctuary

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## Abstract

**Background** The Sumatran rhinoceros (*Dicerorhinus sumatrensis*) is a Critically Endangered species with an extremely low reproductive rate. Conservation breeding at the Sumatran Rhino Sanctuary (SRS), Lampung, Indonesia, plays a vital role in population recovery, where perinatal complications such as dystocia pose significant risks to both dams and calves.

**Objective** To report the clinical management of dystocia and subsequent intensive neonatal care in a captive-born Sumatran rhinoceros at the SRS.

**Case Description** A primiparous female Sumatran rhinoceros delivered a calf on 24 March 2022 following prolonged second-stage labor. The calf was born in posterior presentation with a birth weight of 20 kg, the lowest recorded in captivity. The neonate was weak, immobile, and exhibited signs of perinatal asphyxia with depressed cardiac and respiratory activity.

**Treatment** Obstetrical traction was performed to assist delivery. Immediate neonatal resuscitation included airway clearance, chest compressions, artificial respiration, and oxygen supplementation. Postnatal management involved intensive physiological monitoring, assisted feeding with maternal colostrum, temporary use of milk replacer, probiotic therapy for digestive disturbances, and training to facilitate direct suckling from the dam.

**Conclusion** This case demonstrates that timely obstetrical intervention and comprehensive neonatal intensive care can result in successful survival and normal postnatal development in high-risk Sumatran rhinoceros calves.

**Keywords** Sumatran rhinoceros | dystocia | neonatal intensive care | conservation breeding | Sumatran Rhino Sanctuary

## Introduction

Indonesia is currently the only country in the world that still harbors wild populations of the Sumatran rhinoceros, following Malaysia's declaration of the species' extinction in the wild in 2015. Remaining Sumatran rhino populations in Indonesia are distributed across several key conservation areas, primarily in Way Kambas National Park (TNWK), Bukit Barisan Selatan National Park (TNBBS), Gunung Leuser National Park (TNGL), and West Kutai in East Kalimantan. To prevent further population decline and promote species recovery, the Indonesian government is actively working to increase the number of Sumatran rhinos by supporting intensive breeding programs in captivity and safeguarding their natural habitats.

One of the most notable conservation initiatives is the Sumatran Rhino Sanctuary (SRS) at TNWK, where breeding efforts have yielded significant success. Since 2012, five Sumatran rhino calves have been successfully born, representing a major milestone in ex situ conservation. This success is closely linked to comprehensive reproductive management and intensive maternal–neonatal health care. Health maintenance begins as soon as a mother is confirmed pregnant and continues throughout her calf's development.

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Parturition in mammals, including rhinoceroses, proceeds through three distinct phases. The first of these is the preparation phase, during which cervical dilation and pelvic muscle relaxation occur. The second phase of labor involves the expulsion of the fetus, starting with the discharge of the amniotic sac from the vagina and continuing until the fetus is delivered. The third phase occurs approximately 8 to 12 hours after birth and involves the delivery of the placenta (Neary, 2005). Complications during the second stage, known as dystocia, can significantly increase neonatal mortality risk. Dystocia may result from several factors, including disproportion between the dam and fetus, inadequate pelvic relaxation, fetal malposition, and compromised maternal physical condition during labor (Neary, 2005).

## Case Description and Interventions

A female Sumatran rhinoceros named Rosa was confirmed pregnant, with the estimated delivery date projected for the second to third week of March 2022. This pregnancy was particularly significant, as it followed eight previous miscarriages experienced by Rosa. At the time of pregnancy, Rosa was estimated to be 21–22 years old and nulliparous, making this her first successful gestation. The typical gestation length for Sumatran rhinos ranges from 460 to 479 days, and Rosa ultimately gave birth on day 476 of gestation.

On March 24, 2022, at 08:30 WIB, a white, cloudy mucus plug was observed during defecation, followed by the release of amniotic fluid 30 minutes later. The amniotic fluid continued to flow for 1 hour and 34 minutes before the expulsion of the amniotic sac. The birth process was closely monitored, with attention given to the stages of contraction. During contractions, Rosa predominantly assumed dorso-ventral and lateral recumbency positions, but initially, only the tarsus (ankle) of the calf was visible. The Sumatran rhino calf was born in a posterior presentation, which complicated the delivery. An hour after the appearance of the amniotic sac, no additional body parts of the calf were visible except for the tarsus. Given the lack of progression, obstetrical traction was applied to assist in fetal delivery. The condition of parturition and the interventions performed are shown in **Figure 1**.

The calf was born with a low birth weight of 20 kg, and despite its small size, Rosa experienced marked difficulty during delivery. The calf was born in a weak condition; it was immobile, had a weak heartbeat, and showed no visible movement in the thoracic area. Resuscitation efforts included chest compressions, artificial respiration, oxygen supplementation via a tracheal tube, and the removal of mucus from the nose and mouth (**Figure 1**). After 7 minutes of resuscitation, the calf started to breathe. Oxygen was still being administered, and both heart rate and respiration were being carefully monitored. The calf's heart rate was measured at 78 beats per minute, while its respiration rate was 7 breaths per minute. To help ensure the removal of mucus from the respiratory and digestive tracts, the calf was positioned upside down with its hind legs elevated and its head lowered. Once stabilized, the calf was placed in a safe position and left for the mother to approach. Rosa, the mother, was seen sniffing her calf but did not respond intensely. There were no signs of strong bonding between Rosa and her calf, which is typically observed in other rhino births. Although Rosa approached her calf several times, her interactions were limited, and she often moved away. The calf's weakness prevented it from getting up, standing, or suckling, and the mother's lack of active engagement further hindered the calf's growth and compromised its health.

The calf was still weak after resuscitation and was unable to stand. It was placed in a sternal position, and attempts were made to lift its limbs. The calf tried to lift its body in the afternoon, approximately 3 hours and 24 minutes after birth, but was only able to lift its front legs, with its hind legs remaining on the ground. The calf was then able to stand on its own without assistance at night, 10 hours and 41 minutes after birth. Colostrum was then obtained from Rosa's udder by milking directly and given to the calf. The initial treatment for the calf was to give 3 ml of 50% dextrose orally and 20 ml of colostrum. The calf's physiological status was monitored regularly, and it was found that its body temperature was 37.10°C with a respiration rate of 34 breaths per minute and a heart rate of 90 beats per minute.

Daily weight measurements were recorded until the calf reached 68 days of age, while morphometric data were collected weekly. An orogastric tube was inserted into the calf to feed it both colostrum and milk replacer. The calf was unable to stand for long periods of time, and its neck muscles were too weak to lift its head, even though the mother was encouraged to sleep in lateral recumbency. Since the calf was unable to suckle directly from its mother, milk replacer was also given, in addition to colostrum obtained from the mother, Rosa. On the third day, milk replacer was administered using a milk bottle, and efforts were made to encourage the calf to suckle directly from its mother. Milk replacer for Sumatran rhinos was made from a mixture of skim milk, full cream milk, dextrose, and water.

On day twelve, the calf developed digestive disturbances, including diarrhea, weight loss, reduced appetite, and dull hair coat. Diagnostic and management interventions included physical and fecal examinations, reassessment of milk formulation, and sanitation of the maternity enclosure. The diarrhea was suspected to be associated with the high-fat content of the milk replacer, which may alter intestinal microflora balance. Probiotic therapy was initiated, resulting in clinical improvement within two days, although the weight gain did not resume until day nineteen. Exclusive feeding with milk expressed directly from Rosa was then implemented, and intensive training for direct suckling continued. Following discontinuation of the milk replacer, the calf's development improved markedly, with increased suckling frequency and duration. Through sustained intensive care, the calf exhibited significant and consistent weight gain. Body weight reached 42 kg at one month, 70 kg at two months, and 112 kg at three months. Weight gain followed a linear trend, averaging 0.73–1.4 kg/day during the first three months. After passing the critical neonatal period, the calf demonstrated normal growth and development without observable abnormalities.


**Figure 1** The condition of the delivery and the interventions performed by the team on Rosa and her newborn calf. (A) posterior presentation at birth; (B) resuscitation of the newborn calf; (C) removal of fluid from the calf's respiratory tract; (D) insertion of an orogastric tube; (E) feeding with formula through a bottle; (F) assistance with direct suckling from the mother.

## Discussion

The Sumatran rhinoceros is observed as an animal with a low reproduction rate. Primarily solitary, these rhinos only come together during the breeding season or when a mother is caring for her young. Their reproductive cycle lasts 3–4 weeks, with a gestation period of 15–16 months and a nursing period of 1.5–2.5 years. Nulliparous females tend to exhibit relatively shorter gestation periods than multiparous females (see **Table 1**, n=4), a pattern that has implications for reproductive management. These prolonged reproductive intervals, coupled with low conception success, significantly contribute to population decline. Factors inhibiting pregnancy include anestrus, reproductive pathologies, systemic disease, and reduced breeding capacity (Hermes *et al.*, 2020).

Dystocia is considered rare in rhinoceros species (Brenner *et al.*, 2023). However, when it occurs, it is often associated with nulliparity, maternal obesity, or inadequate energy reserves during labor (Hermes *et al.*, 2020). Treatment for dystocia is determined based on the conditions that occur. In this case, fetal traction was performed to assist delivery. The second stage is a critical point in determining whether delivery requires assistance. The duration of delivery in stage 2 can range from 30 minutes to 4 hours (Neary 2005). However, delivery management was performed on this rhino because there was no change in the position of the fetus after 1 hour from the start of phase 2.

The fetus presented in a dorsosacral position with posterior presentation and female sex. Studies indicate that posterior presentations result in longer second-stage labor durations compared to anterior presentations (Brenner *et al.*, 2023). Hermes *et al.* (2020) reported that approximately 40% of anterior presentations are completed within 25 minutes, whereas posterior presentations require an average of 47 minutes, regardless of the fetal sex.

The average weight gain of Asian rhinoceroses' calves is approximately 1.2 kg/day (Kirkwood *et al.*, 1989). Three Sumatran rhino calves born at the Cincinnati Zoo weighed 35.4 ± 3.15 kg, whereas five calves born at SRS TNWK averaged 24.8 ± 3.15 kg. Based on these eight calves' records, the 20 kg birth weight observed in this case represents the lowest recorded for a captive-born Sumatran rhino. Contributing factors likely included Rosa's advanced age at first parturition and compromised physical condition. Rosa suffered from

**Table 1** Gestation period of female Sumatran rhinos and sex of their calves born in captivity

| Category | Female individual (Captivity) | Gestation period (sex of the calf) | | |
|---|---|---|---|---|
| | | 1st | 2nd | 3rd |
| Nulliparous female | Rosa (SRS, Indonesia) | 476 days (F) | - | - |
| | Delilah (SRS, Indonesia) | 461 days (M) | - | - |
| | | Average = 468.5±10.6 days | | |
| Multiparous female | Emi (Cincinnati Zoo, USA) | 476 days (M) | 478 days (F) | 479 days (M) |
| | Ratu (SRS, Indonesia) | 470 days (M) | 477 days (F) | 478 days (F) |
| | | Average = 476.3±3.3 days | | |

uterine fibroids and cysts in both uterine horns. These factors resulted in difficulty in embryo implantation, leading to miscarriages (Hermes *et al*., 2014). Her successful first birth at approximately 21 years of age contrasts with other females that typically give birth between 7 and 12 years of age. Sumatran rhino milk closely resembles African rhino milk in water content but contains higher lactose and lower protein and fat levels, differing substantially from cow's milk. High lactose content supports rapid neonatal growth, although milk composition changes with lactation stage, characterized by decreasing lactose and fat and increasing protein (Zainuddin *et al*., 1998). Milk replacer formulations for Sumatran rhinos, therefore, aim to reduce fat content while maintaining adequate lactose and protein, achieved by combining skim milk, diluted full-cream milk, and dextrose as an energy source.

## Conclusion

This case highlights the critical importance of intensive perinatal and neonatal management in endangered species conservation, particularly for individuals with reproductive or physiological risk factors. Comprehensive knowledge of parturition stages, early neonatal care, appropriate obstetrical intervention, and adaptive nutritional management is essential for improving survival outcomes. Careful formulation and continuous evaluation of milk replacers, alongside close monitoring of growth and physiological parameters, are vital during the neonatal period. The successful survival and development of this calf demonstrate that intensive, evidence-based veterinary care can overcome significant biological and reproductive challenges, contributing meaningfully to the long-term conservation of the Sumatran rhinoceros.

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