department that are scientifically managed, the temple elephants are not scientifically managed so as to fulfill their physiological and psychological needs. As a result, these temple elephants are found to be abnormal both in their physiological and behavioral status. These isolated non-breeding populations of temple elephants that number more than fifty, received the attention of the Government for their scientific management. The government of Tamil Nadu, with their own funds, came forward to rejuvenate these elephants by rearing them together for about two months in camps in a forest environment. Several teams of experts are employed to attend these annual camps. This rejuvenation camp that started in the year 2003, has completed its eighth round in 2016. The paper explains the impact of these rejuvenation camps with reference to the overall health of the elephants for a prolonged healthy survival. Elephants being a mega herbivore, have access to around 200 species of flora in the wild. In the rejuvenation camp a well-balanced, nutritious palatable concentrate diet supplemented by vitamins, minerals, micro nutrients, 'ayurvedic' and 'siddha' (Indian medical systems) ingredients along with variety of green fodder is provided as per the prescription of expert veterinarians. Foot ailments were common in captive elephants as they were mostly maintained on hard substrates. The substrate at the camp site is close to natural elephant habitat substrate hence walking on it improved their health and foot condition. Various strategies in organizing the camp such as, selection of site, method of transport, protection in the camp site etc., and various scientific management inputs such as balanced food, medical aid, physical exercise etc., will be discussed.

Pregnancy and birth of second Sumatran rhinoceros calf in Sumatran Rhino Sanctuary, Way Kambas National Park, Indonesia

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Sumatran Rhino Sanctuary

The Sumatran rhinoceros (*Dicerorhinus sumatrensis)* is one of the most threatened mammals in the world and listed as Critically Endangered by IUCN. Within two decades the number has decreased from 200-400 in 1985 to only around 100 animals in the world (SRCS, 2013). Any mortality or natality significantly impacts this small population. Efforts to breed this species in captivity started over a century ago, while an intensively managed program started three decades ago. Today, only 5 captive bred Sumatran rhinoceros have been born. The Sumatran Rhino Sanctuary, an intensive breeding center for Sumatran rhinoceros within its natural habitat in Way Kambas National Park, Indonesia, hosts 3 males and 4 females. One of the females named Ratu, age 15, gave birth to a healthy female Sumatran rhinoceros calf on 12th of May 2016, sired by Andalas, born at the Cincinnati Zoo and Botanical Garden in 2001. On 22nd of January 2015, the staff detected by ultrasound examination that Ratu had good sized follicle (18x24mm). On same day, mating occurred twice, with a duration 10 and 25 minutes. Her follicle was detected as ovulated on a post-breeding ultrasound check on 24th of January 2016. Sixteen days after ovulation an embryonal vesicle was detected with 15 mm diameter on right uterus horn. On day 36 of pregnancy the vesicle enlarged to 62 mm with 16 mm of embryo length, heartbeat of the embryo could be observed at this age of pregnancy. An early stage foetus was observed on day 48 with 23 mm length, the vesicle diameter could not be measured due to limitation of ultrasound machine. On day 70 the foetus length increased to 32 mm. On day 112 an image of head of the calf was captured using ultrasound, showing the length of the head to be 52 mm, and the total foetus length estimated to be 150mm. Development of the foetus could not be monitored further, only vital signs of heartbeat and foetal movement. The foetal heartbeat was 120 bpm. On 466th day of pregnancy, Ratu was placed in a boma with CCTV installed in order to allow intensive monitoring of early birth signs. Signs were monitored on two parameters, physical and behavioral signs. A unique behavioral sign was observed before parturition, Ratu was putting her front

legs high up almost vertically on tree, more frequently when closer to parturition. On 03:00 am 12th of May 2016, on day 477, the first sign of parturition was observed. Ratu suddenly woke from her sleep and made vocalizations, and walked around briskly. At 04:05 am the amnionic sac broke and Ratu had more intensive contractions, both while laying down and in a standing position. At 04:48 am the amnionic sac was protruding and at 5:11 am both of the calf's hind legs were protruding. At that time, it was observed that the birth will be a posterior presentation. On 5:40 am the calf was born and started breathing 1 minute later. The calf started to walk 1 hour after birth and started to nurse 2 hours after birth. The calf has gained an average of 1 kilogram per day.

Acoustic detection and monitoring as a conservation tool

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The decline of habitat for elephants due to expanding human activity is a serious conservation problem. This has continuously escalated the human–elephant conflict in Africa and Asia. Elephants make extensive use of powerful infrasonic calls (rumbles) that travel considerable distances. In principle, this makes elephants well-suited for acoustic monitoring because it enables detecting elephants even if they are out of sight. In addition using acoustic signals to actively control or manipulate the spatial use of elephants is increasingly considered. But these applications require a detailed knowledge about elephant vocal behavior, the acoustic structure including all kind of natural variability, and the functional relevance of vocalizations, necessitating the collaboration of biologist and computer scientists. We will provide an integrated overview of our interdisciplinary project that established the scientific fundamentals for a potential future acoustic early warning and monitoring system. We present a method for the automated detection of elephant (*Loxodonta africana*) rumbles that is robust to the diverse noise sources present in situ. We evaluated the method on an extensive set of audio data recorded under natural field conditions in South Africa. Results show that the proposed method outperforms existing approaches and accurately detects elephant rumbles. From our project results we draw a number of conclusions that are discussed and summarized. We clearly identified the most critical challenges, restrictions, limitations and necessary improvements of the proposed detection methods and suggest that our findings have the potential to form the basis for a future automated early warning system for humans living in human-elephant conflict areas. We conclude that a long-term evaluation of the presented methods in situ using real-time prototypes is the most important next step to transfer the developed methods into practical implementation.

What elephant rumbles tell us about the sender?

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Sound production mechanism in various mammal species is considered to be well explained by the so-called 'source-filter' theory, which states that a vocal signal is generated by vibrations of the vocal folds in the larynx (source) and modified acoustically by the vocal tract (filter) between the larynx and the mouth. Recent comparative data revealed that vocal tract resonance frequencies (formants) are cues to vocal tract length and body size in animals, and have a functional relevance in a variety of behavioural