



# Lightning deaths in free ranging Asian elephants (*Elephas maximus*) in Deogarh, Odisha, India

NIRANJANA SAHOO<sup>1\*</sup>, SOURABH RANJAN HOTA<sup>2</sup>,  
R.K. SAMANTARAY<sup>3</sup> AND ALOK KUMAR DAS<sup>3</sup>

<sup>1</sup>Centre for Wildlife Health, <sup>2</sup>Department of Veterinary Epidemiology and Preventive Medicine,  
Orissa University of Agriculture and Technology, Bhubaneswar, Odisha, India

<sup>3</sup>O/o Chief District Veterinary Officer, Deogarh, Fisheries and Animal Resources  
Development Department, Government of Odisha, India

\*niranjanasahoo@hotmail.com

Date of receipt: 25.07.2017

Date of acceptance: 29.09.2017

## ABSTRACT

Lightning has long been established as one of the killers of domestic as well as wild animals especially in tropical and subtropical regions of the world. Very limited scientific studies are available on such deaths especially in wild elephants. Present study is based on the investigation of the cause of death of three free-ranging Asian elephants in a remote forest area of Deogarh district of Odisha, India. In this case, all the three elephant carcasses were found in close proximity in a particular direction. There was absence of any signs of struggle near the site of death. Skins were found to be highly desiccated with distinctly marked protrusion of the eyeballs in all the three carcasses. There were absence of pathological lesions in any of the visible body parts. The most striking character was the presence of a char mark in the postero-medial thigh of left hind limb extending up to the level of abdomen of the first elephant, probably leading the herd. These findings along with the circumstantial evidence of burn marks in nearby trees and history of thunderstorm two days prior to the discovery of the carcass, confirmed lightning as the cause of death of these three elephants.

**Key words:** Asiatic elephant, Deogarh, lightning, post-mortem examination

## INTRODUCTION

Since early part of the 18<sup>th</sup> century, lightning has been reported to be a natural significant hazard for sudden death among humans. Near about 2,40,000 people are injured by lightning throughout the world causing around 24,000 deaths every year (Zielinski, 2016). However, humans aren't the only victims of this hazard. Every year, based on media reports, thousands of lightning deaths also occur in domestic as well as wild animals.

Though there are a number of scientific case reports available on lightning deaths in domestic animals (Boeve et al., 2004; Van Alstine and Widmer, 2003; Bedenice et al., 2001; Williams,

2000; Appel, 1991; Ishikawa et al., 1985; Karobath et al., 1977; Brightwell, 1968), limited scientific information on lightning are available on wild animals in general and elephants in particular (Žele et al., 2006). Few cases have been reported in elephants (Gomes, 2012), giraffes (Naish, 2009), seals (Zielinski, 2016) and reindeers (Libell, 2016). lightning in a remote forest area of Deogarh district of Odisha, India.

## MATERIALS AND METHODS

Carcasses of three Asian elephants were initially detected by the people of nearby villages on 12<sup>th</sup> June 2016 on Damdami hill in the Pravasuni

Reserve Forest in Deogarh district of Odisha with GPS coordinates 21° 32' 15.6480" N and 84° 44' 1.3920" E. The location was marked by the presence of a water reservoir at the foothill. As per the Govt. of India procedure, the incidence was communicated to the concerned forest officer (Divisional Forest Officer, Deogarh, Sambalpur, Odisha) for subsequent follow-up actions.

Following communication from the forest officials to the Centre for Wildlife Health, Orissa University of Agriculture and Technology (OUAT), regarding the episode, a team of veterinary professionals rushed to the spot for investigations. After tracking a forest path for a distance of about eight kilometres inside a Sal (*Shorea robusta*) dominated forest, carcasses of these three elephants were noticed on the top of a hillock. The detailed necropsy of the carcasses was conducted at the site of death and the bodies were safely disposed using deep burial method as per the standard necropsy guidelines.

## RESULTS AND DISCUSSION

Bodies were in close proximity to each other with their heads in one direction. Of the three elephants, two were adult females while third was a calf whose sex could not be explored owing to putrefaction and mutilation of the carcass. No signs of struggle were noticed at the site of the death of the incident which aroused the suspicion of per acute death at a particular time period. The nearby ground with respect to grass, bushes and top soil were almost intact. In this particular case, the acute death of the three elephants were occurred in the same place, time and direction. Evidence of singeing was noticed in the adjacent tree leaves.

Close examination of the carcasses revealed presence of extensive maggots and putrefaction. The size of the maggots suggested death to be within 48 to 72 hours. The levels of putrefaction in all the three elephants were up to the same level. The physical measurements of the three carcasses are mentioned hereunder. There were marked protrusion of the eyeballs in all the three carcasses. The skin of each carcass was found to be highly desiccated and charred. There was

absence of any gross pathological lesion in any of the visible portions of the carcass. There were no circumstantial evidences leading to any kind of struggle before death. All these above findings ruled out the possibility of poisoning. The most striking evidence was the presence of a char mark extending the entire left hind limb of the first elephant, probably leading the herd, which directed through the medial and downward side resulting in rupture of the abdomen. Interaction with the local villagers residing in the area surfaced the fact that there was heavy rainfall accompanied with a series of thunderstorm and lightning in that area two days prior to the discovery of the carcasses. Long bones of all the three carcasses were examined which did not reveal any marks of fracture. Tissue samples were found unsuitable for further investigation.

**Table 1.** Morphometry of the three elephant carcass

Elephant carcass	Measurements (ft)				
	Height	Tail length	Back	Trunk	Girth
1	7.1	3.6	10.7	5.0	14.4
2	4.5	2.8	7.1	3.4	7.8
3	8.4	4.1	11.7	5.5	12.8

Based on the characteristic external signs common to all the three carcasses with the circumstantial evidence as described above, death in three free ranging Asian elephants, an exceptionally rare incidence, were attributed to the lightning. Supportive evidence for lightning includes the presence of normal ingesta (especially in the rumen/stomach), lack of frothy ingesta (frothy bloat), and presence of normal faeces in the lower tract and peracute death clustered in a small area (Kahn and Line, 2011) which substantiate the findings in this case. In case of lightning strike, the post-mortem distension of the rumen/ stomach occurs rapidly and the blood tends to clot slowly or not at all which must be differentiated from other disease conditions like anthrax, clostridial infections and poisonings. There was pooling of



**Fig. 1.** Hilly terrain of the elephants death site; **Fig. 2.** Elephant carcass amidst tall Sal trees; **Fig. 3.** Three Asian elephant carcasses in a single direction with close proximity to each other; **Fig. 4 & 5.** Singeing leaves of the shrubs and trees near the carcass; **Fig. 6.** Marked desiccated appearance of skin indicating dehydration; **Fig. 7.** Char mark on the postero-medial aspect of left hind limb of the 1<sup>st</sup> elephant extending upto the abdomen; **Fig. 8.** Ruptured abdomen with pooled bloody discharges in the surrounding area; **Fig. 9.** Carcass mutilated with maggot infestation; **Fig. 10.** Necropsy examination of the carcasses with recording of morphometry; **Fig. 11.** Exophthalmia in the carcasses; **Fig. 12.** Degenerated oral cavity and trunk exposing molar teeth.

blood beside the carcasses but lack of oozing of blood from natural orifices ruled out the possibility of anthrax. In addition, absence of any pathological changes in the stomach and intestinal mucosa with normal faeces in moderate quantity played down the suspicion of death due to poisoning.

Reports of electronic and print media reveals that India have precedents of lightning deaths in elephants. Five elephants in West Bengal state, India died due to lightning in May, 2007. Lightning also accounted for death of two elephants in Tamil Nadu, India in August, 2014. There were no publications available as such in any of the journals over the above reportings.

Numerous literatures are published on the mechanisms of lightning injuries to human beings (Norman et al., 2001; Cooray et al., 2007; Gomes and Kadir, 2011) which can be grossly applicable to animals as well. Lightning is a phenomenon based on atmospheric electricity that brings extremely large impulsive currents to earth with the death of the animals due to high voltage direct current. Especially, animals having a large separation between their front and back feet such as elephants, are vulnerable to receive lightning injuries due to the dangerous potential differences that may built up between these feet, in the event of nearby lightning (Gomes, 2012). Moreover, wild animals are particularly more susceptible to lightning due to lack of well-protected shelters during thunderstorms and cyclones. This justifies the higher susceptibility of pachyderms to lightning strikes during adverse weather conditions.

In most instances of electrocution by lightning stroke, death is instantaneous and the animal falls without a struggle (Kahn and Line, 2011). This reinforces the observations of lack of evidence of struggle during the death of elephants in this case. Injury from lightning may be limited to a superficial burn of the skin of the lids and singeing of the brows and lashes, or it may involve the deeper subcutaneous tissues and muscles or may extend even up to the fracture of bones. Burns

may be linear, punctuate, full-thickness burns, feathering or flowering (Lichtenberg figures), thermal burns from heated metal, laceration burns through skin or combinations (Cooper, 1980). Singe laceration marks tend to be linear and are more commonly found on the medial sides of the legs (Kahn and Line, 2011) which is in line with the findings of lacerations in the above study. Other injuries are optic neuritis, paralysis of the extraocular muscles and fracture of the orbital bones which may result in orbital emphysema or ecchymosis with exophthalmos as described by Hansell (2012) which corroborates the findings of protruded eyeballs in all the three pachyderms in this case.

## CONCLUSION

It was concluded that the first elephant (leader) was apparently struck by lightning strike while the rest two became the victims during the course of the group movement, thereafter in an instant which resulted in death of all the three elephants in one direction at the same spot.

## ACKNOWLEDGEMENT

Authors herewith extend their hearty thanks and gratitude to the Divisional Forest Officer, Assistant Conservator of Forests and Chief District Veterinary Officer, Deogarh District, Odisha for extending requisite logistics to carry out the investigation.

## REFERENCES

- Appel, G. 1991. Deaths in swine by a lightning strike in the sty. *Deutsche Tierärztliche Wochenschrift* **8**: 187–190.
- Bedenice, D., Hoffman, A.M., Parrott, B. and McDonnel, J. 2001. Vestibular signs associated with suspected lightning strike in two horses. *Vet Rec.* **149**(17): 519–522.
- Boeve, M.H., Huijben, R., Grinwis, G. and Djajadiningrat-Laanen, S.C. 2004. Visual impairment after suspected lightning strike in a herd of Holstein-Friesian cattle. *Vet. Rec.* **154**: 402–404.
- Brightwell, A.H. 1968. Lightning stroke in livestock. *Can. Vet. J.* **9**: 186–188.

- Cooper, M.A. 1980. Lightning injuries: prognostic signs for death. *Ann. Emerg. Med.* **9**(3): 134–138.
- Cooray, V., Cooray, C. and Andrews, C.J. 2007. Lightning caused injuries in humans. *J. Electrostat.* **65**: 386–394.
- Gomes, C. and Kadir, M. 2011. A theoretical approach to estimate the annual lightning hazards on human beings. *Atmos. Res.* **101**: 719–725.
- Gomes, C. 2012. Lightning safety of animals. *Int. J. Biometeorol.* **56**(6): 1011–1023.
- Hansell, H.F. 2012. *Text-book of Diseases of the Eye; for Students and Practitioners of Medicine.* Rarebooksclub.com, Miami, Florida, United States. p. 152.
- Ishikawa, T., Ohashi, M., Kitagawa, N., Nagai, Y. and Miyazawa, T. 1985. Experimental study on the lethal-threshold value of multiplesuccessive voltage impulses to rabbits simulating multi-strike lightning flash. *Int. J. Biometeorol.* **29**(2): 157–168.
- Kahn, C.M. and Line, S. 2011. Overview of lightning stroke and electrocution. The Merck Veterinary Manual 10<sup>th</sup> edn. Merck and Co., USA, pp. 596–598.
- Karobath, H., Redtenbacher, M., Hofecker, G., Walde, I. and Syré, G. 1977. Causes of death in lightning strokes (originally in German). *MMW Munch. Med. Wochenschr.* **119**(1): 29–32.
- Libell, H.P. 2016. Lightning strike kills more than 300 Reindeer in Norway. *The New York Times.* August 29, 2016.
- Naish, D. 2009. Death by lightning for giraffes, elephants, sheep and cows. Tetrapod Zoology. Posted on July 15, 2009. <http://scienceblogs.com/tetrapodzoology/2009/07/15/mammal-deaths-by-lightning/>
- Norman, M.E., Albertson, D. and Younge, B.R. 2001. Ophthalmic manifestations of lightning stroke. *Surv. Ophthalmol.* **46**(1): 19–24.
- Van Alstine, W.G. and Widmer, W.R. 2003. Lightning injury in an outdoor swine herd. *J. Vet. Diagn. Invest.* **15**: 289–291.
- Williams, M.A. 2000. Lightning strike in horses. *Compend. Contin. Educ. Pract. Vet.* **22**: 860–866.
- Žele, D., Bidovec, A. and Vengušt, G. 2006. Atmospheric flash injuries in roe deer (*Capreolus capreolus*). *Acta Vet. Hung.* **54**(1): 43–49.
- Zielinski, S. 2016. Animals get struck by lightning, too. Wild Things: Animals, Conservation. January 7, 2016. <https://www.sciencenews.org/blog/wild-things/animals-get-struck-lightning-too>