International Journal of Advanced Education and Research
www.alleducationjournal.com
ISSN: 2455-5746
Received: 28-11-2022, Accepted: 14-12-2022, Published: 31-12-2022
Volume 7, Issue 4, 2022, Page No. 69-72

The unnatural deaths of 18 elephants in Bamuni hillock of Nagaon, Assam

Kulen Ch Das
Associate Professor in Economics, Nowgong Girls' College, Nagaon, Assam, India

Abstract
Quite often we hear cases of lightning striking people to grave injury or even to death. But, can lightning kill a large number of gigantic animals together at one stroke? Though it seems quite impossible there are instances. This paper examines a recent case of the unnatural death of 18 elephants in a tragic incident that occurred over the Bamuni hillock under the Nagaon Forest Division of Assam on May 12, 2021. Widespread discontentment among various sections of the people and a group of environmentalists broke out over the unfortunate and extremely tragic incident. This paper is, thus, an attempt to examine the actual cause of the elephants' death and carried out a field survey among the residents in the vicinity of the place of occurrence besides taking the help of the departmental investigation report. A few environmentalists and conscious citizens also were interviewed. Most of the villagers, the environmentalists, and the conscious citizens of the state sensed foul play and demanded a broader investigation of the incident. However, despite allegations, the investigation carried out by the forest department confirmed the deaths of these large numbers of pachyderms were due to lightning strikes only.

Keywords: lightning strike, pachyderm, carcass, charred, post-mortem, rigor mortis

Introduction

Lightning is one of the oldest and strongest observed natural phenomena that occur on earth (Arshad, *et al*., 2018) [1]. Lightning is a discharge of electricity that occurs in the atmosphere and can be thought of as a high current – about 20,000 amperes – electric spark associated with thunderstorms. The lightning or spark can occur between clouds, between sections of a single cloud, between the cloud and air, or between the cloud and the ground – or some object on the ground. It is produced when supercooled liquid and ice particles above the freezing level collide and build up large and separate regions of positive and negative electric charges in the clouds. The most common type of lightning discharge is cloud-to-ground, or negative lightning, which accounts for 90 per cent of all lightning strikes (Rash, 2010) [10].

Every year thousands of men and animals worldwide succumb to lightning injuries (Gomes, 2012; Shankar & Braddon, 2015) [7, 11]. In analysing the TORRO's UK database of lightning injuries and deaths for the period from 1993 to 1999, Elsom (2001) [5] estimated that on average, 49 people are struck by lightning each year. Similarly, a total number of twenty-two deaths have been reported during a period of eleven years starting from 2000 to 2010 in Greece, resulting in a calculated average number of 2 victims per year (Peppas, *et al*., 2012) [8].

Animals are particularly vulnerable as they are usually placed outside during severe storm events. Animals that have a large separation between their front and back legs (such as cattle) are extremely vulnerable to receiving lightning strike injuries due to the dangerous potential differences that built up between those feet during lightning strike events (Gomes, 2012; Shankar & Braddon, 2015) [7, 11].

A case of a presumed lightning strike has been described in the Central West region (Watt, 2011). Elsewhere, since 1943, there have been 22 reported incidents involving animals and lightning strike events (Gomes, 2012) [7]. A lightning strike is viewed as a relatively uncommon cause of trauma in domesticated animals; however, heavy mortalities can occur when several animals have congregated near a tree or water source (Radostits, *et al*, 2007) [9]. A large number of animal deaths, i.e., 70 deaths, were recorded during the year 2009 in Greece (Peppas, *et al*., 2012) [8]. It is also reported that 95 per cent of death occurred during May – September and the highest number of deaths occurred in the months of June – August. However, the largest recorded animal death so far by lightning strike occurred near Vesle Saure lake in the Southeastern part of Hardangervidda National Park of Norway. The deadliest lightning strike occurred on August 26, 2016, that killed a massive 323 reindeer causing shock to wildlife lovers across the world (Westermann, 2020) [14].

Peer-reviewed scientific literature about animals and lightning strikes is scarce (Shankar and Braddon, 2015) [11]. Many of the reports of lightning strike events mentioned in popular media are compiled by authors of a non-scientific background, with the facts distorted to enhance the audience's attention (Gomes, 2012) [7].

Mechanisms of lightning strike injury include a direct strike, side flashes, step potential and touch potential (Golde and Lee, 1976; Elsom, 1996; Gomes, 2012) [6, 4, 7]. A direct strike is where enormous quantities of energy pass through the body very quickly causing resultant burns, organ damage and damage to the flesh and bones.

Side flashes are where animals underneath a large tree or pole receive a side flash if the tree is hit by lightning. Touch potential is where a partial current may pass through the body of an animal if part of the animal's body comes into contact with a higher elevation of a lightning-struck object while the other parts of the animal remain in contact with the ground. Step potential is the most common lightning injury amongst animals. "When the feet of an animal are separated in the direction of increasing potential, a partial current may pass through the body in contact with the ground align in the direction of potential gradient developed

due to the injection of current into the Earth from a nearby lightning strike".

Objectives

In an extremely unfortunate event, 18 pachyderms were found dead on May 13, 2021, on the top of the Bamuni hillock in the Kondoli Proposed Reserve Forest (PRF) under the Kathiatali range of Nagaon Forest Division. Though the incident was declared a case of lightning strike prima-facie, however, there was large-scale controversy and speculation over the cause of the tragic unnatural death of these giant animals.

This paper, thus, is a humble attempt

- to analyse the controversy and speculations over the unnatural death of the elephants, and
- find out the actual cause of the deaths based on the report submitted by the forest department as well as the existing literature on lightning strikes.

Materials and Methods

1. Study area

The area of Nagaon Forest Division consists of 20 (twenty) Reserve Forests and 15 (fifteen) Proposed Reserve Forests within the modified boundary of the civil district within the geographical limits of East Longitude 92^0 0′& 93^0 30′, North Latitude25^0 30′& 26^0 30′. Most of the Reserves are situated on the outlying stretches of the Karbi-Anglong Hils and Meghalaya Hills and often contain steep slopes such as are found in the Sonaikuchi Kholahat Daboka (part), Kafitoli, Swang, South Dijoo & Bagser. The slopes are comparatively moderate and the terrain is more or less undulating with khurkhani mounds dotted with beels and swamps in case of the reserves. The total area of the reserve forests of the entire division is approximately 337.79 Sq Km.

2. Background of the area of occurrence

Kondoli PRF is situated in Chalchali Mauza surrounded by Mikir Hills in its east and south and by Tapatjuri Tea Estate in the North and Soti Kondoli village in the west. The 680 hectares large area of the PRF is having miscellaneous forests and is suitable for teak plantations. The unfortunate event occurred on top of the Bamuni hill which is located between N 26^0 16.708/ E 92^0 47.336. The terrain is hilly, having a steep slope, and 790 feet above the mean sea level. The surrounding forests were destroyed and trees, especially teak, had been felled indiscriminately since the first half of the 1990s. Now forests in the entire area are extremely degraded and the hilltop of Bamuni hill, where the incident occurred, is devoid of any big trees and thus canopy cover.

3. Data

The study is based both on primary and secondary data. Secondary data is obtained mainly from various books, journal articles, book chapters, and other scientific studies carried out across the world. The newspaper clippings of those days and the investigation reports submitted to the Government of Assam by the Forest Departments were of great help in analyzing the incident. The data on the forest area, location, etc., were collected from the Nagaon Forest Division. Besides visiting the place of occurrence to have a first-hand experience of the situation, a Participatory Rural Appraisal (PRA) method, i.e., focus group discussion and personal interview, was undertaken to elicit the views of the surrounding villages of the Bamuni hill. Telephonic conversation with a few environmentalists and conscious citizens across the state also helped understand the incident.

Results and discussion

1. Deforestation near the place of occurrence

The entire region from Bagser Reserve Forest in the east to Kondoli PRF is hilly terrain bordering Karbi Anglong district and are known elephant habitat since time immemorial. The habitat stretches to Numaligarh in Golaghat district in the east and towards Doboka Reserve Forest in the southwest of the area of incidence. Human-elephant conflict is quite prevalent here. The Bamuni hill, popularly known as Tapoṭjuri hill, where the elephants died, is located in front of the Sukanjuri hill and both the hills are covered by only some secondary vegetation. The primary forests have been destroyed completely during the first half of the 1990s as the locals opine. The degraded forests cannot afford to feed the large number of elephants residing in the entire stretch. Consequently, these elephants come out of forests in search of food, especially during the harvesting season of winter paddy and end up confronting and conflicting with humans. All works of precaution and depredation of the villagers seem failed. This conflict looks acute under the Kathiatoli range of the Nagaon Division and results in massive damage to household property and even significant human casualties.

On the night of May 12, 2021, 18 elephants died in the Bamuni hillock in the Kondoli Proposed Reserve Forest under the Kothatoli range. The dead bodies of the pachyderms on the foothills were first seen the next day, i.e., 13th May 2021, by the local villagers and immediately reported to the nearby forest officials. The forest department acted promptly and visited the place to find 18 elephants dead in two different locations. Declaring it as a case of lightning strike prima-facie, a quick inquiry on the incident has been declared by the Minister of Environment and Forests, Government of Assam and an investigation team has been formed.

This is an unexpected and a major tragedy for animal lovers though it is not uncommon. However, it is an extremely rare and only known incident of large numbers of elephant death at one stroke across the world as said by renowned elephant experts and conservationists of the state. There are examples of similar incidences where elephants were killed in Buxa Tiger Reserve in West Bengal and even in Manas Tiger Reserve of the state besides incidences that occurred in Sri Lanka and Thailand (Conversation with environmentalists published in Assam Tribune). The conservationists opined that the Bamuni hillock where the tragic incidence occurred is devoid of large and thick vegetation. It is rather quite barren and without a single tall tree to take the brunt of the lightning demonstrating the massive destruction of the habitat of large wild animals in the area.

2. A different angle to the incident – Case of a Private Power Company

As this is supposed to be the first such shocking incident in the state of Assam where 18 elephants have fallen prey to lightning, massive hues and cries were raised by environmental activists and animal lovers across the state. A section of the local villagers, during the personal interviews and focus group discussions, outrightly denied hearing any sound of a loud thunderbolt that could have killed 18 giant

animals. The locals and some of the animal lovers, rather, seem to find some connection between a company, which has been putting up a power plant to generate solar power, and the death of the elephants. It is worth mentioning here that a Delhi-based private power company is building up a 16 MW solar power project on the agricultural fields of the Mikir Bamuni cluster of the villages. The site of the power plant has been located between the two hillocks of Topotjuri and Sukanjuri and is surrounded by Mikir Bamuni, Balidhepa, Murgilorai, Natun Danga and Aamdanga villages resided by the Karbi and Adivasi communities. The power company has been allotted 286 bighas of agricultural land being cultivated by the villagers for years. The villagers were reluctant to give up their rights over the land they have been cultivating for years and tried to resist such a move by the district administration. However, the administration forcibly evicted them and allotted the land to the power company. The villagers are anticipating, as such, a loss of their livelihood and have been continuously protesting for the last couple of years against the building up of the power plant. The primary survey confirms that the villagers whose land has been taken over forcibly have not been paid compensation by the power company. Out of 150 households, compensation so far has been paid to 5/6 households only and that too partially. All these households live on small and marginal farming and also engaged in wage-earning activities during the slack season. The loss of land (livelihood) would make them poorer and more dependent on the surrounding hills which are already severely degraded. The members of the Fact-Finding Committee of Delhi Solidarity Group which works on social justice and social movements, who visited the power plant site, reported the entire area to be part of an elephant corridor and thus ecologically a sensitive region. The report said that the construction of the power plant had blocked and disrupted the normal movement of the elephants in the area (conversation with Assam Jatiyatabadi Yuba Chatra Parisad - AJYCP, a non-political student organisation, leader and Assam Tribune). The environmentalists and the locals have wondered how the company has been permitted to set up the power plant in an area of such ecological significance.

3. The environmentalists' view

A group of environmentalists and conscious citizens of the state are reluctant to follow the theory of lightning strikes. It is pointed out by the group that as the elephants were found in a scattered position and in such a situation it is difficult to admit that the lightning killed everyone. A massive thunderbolt may kill four to five elephants and the rest could have been injured. Moreover, the chances of repeated lightning in the same place are not acceptable under any scientific argument (The Hills Times, 2021) [12]. These environmentalists and citizens altogether bluntly rejected the possibility of a direct strike, side flash and touch potential as a cause and rather tried to examine if, at all, it might be an instance of step potential which caused the unfortunate death of the elephants. They said, "So, the only possibility left would be a step potential generated because of a cloud-to-ground strike. This is the most common lightning hazard for animals. Since we have been talking about the death of 18 gigantic animals, the intensity of the strike would have been massive. The resultant heatwave, measuring over $50,000^0$ Fahrenheit, which is about four times the heat of the Sun, would burn the entire topsoil and the associated greenery like grasses and shrubs. All the microorganisms present in the soil would perish. But there is no evidence to suggest this theory as well. Moreover, it is worth mentioning that the tree which has been shown as struck by lightning is at an altitude of 254 meters. But, the tallest and the largest tree in the vicinity is at an altitude of 279 meters, the altitude of the table top of the hill. The logic here defies why lightning would strike a much smaller tree and spare the larger and taller one". Therefore, they sensed foul play in the incident. They further pointed out non-forestry activities flourishing in the vicinity of the reserve forest areas which is a prime elephant habitat. The case of vanishing more than a thousand teak trees from the hillock along with issuing the required NOC (no objection certificate) to a solar power plant on this habitat ought to be inviting a parallel inquiry, they opined. Having said this these environmentalists and citizens demanded a high-level and broad-based inquiry by a team comprising electrical engineers, geo-physicists, geologists, microbiologists, forensic experts from the crime branch, members of the Project Elephant and Veterinary doctors to unearth the mystery behind the unnatural deaths in a scientific, transparent and conclusive manner. The concerned authority never paid heed to their demand.

4. Findings of the Deuri Committee Report

Consequent to the incident, Sri K.K. Deuri, Deputy Conservator of Forest (DCF) was appointed as an Inquiry Officer (IO), besides a group of expert veterinarians, under the provision of Section 50(8) of the Wildlife (Protection) Act, 1972, to investigate the unfortunate deaths of 18 elephants.

As per the investigation report, there were 7 sub-adults, 3 juveniles, 5 calves and 3 young adult elephants. Out of 18, 8 were males and the rest are females. All 18 carcasses of elephants were lying in two different locations around the geographic coordinates of Latitude of 26.27925 degrees and Longitude of 92.78821 degrees, 14 on the top of the hill and 4 of them found on the foothills of the Bamuni hillock within a radius of 150 – 150 meters. It seemed that 4 carcasses slipped off from the edge of the hill. These elephants are said to be died due to electrocution by lightning looking into the prima facie evidence found on the site by the veterinarians and the forest officials and later to be confirmed by the initial finding and the final post-mortem report. A tree bearing signs of lightning was observed on the site and the elephant carcasses were lying around the tree. The closest carcass was found at a distance of 8.43 meters from the primary lightning strike tree and the highest being 130.27 meters. For confirmation of the occurrence of the lightning report from the North East Space Application Centre (NESAC), Umiam, Meghalaya, was collected which said that between 5.30 AM on 12 May and 5.30 AM on 13 May, a strong thunderstorm developed and passed from the North West to South West covering the location where the elephants died.

The investigation team carried out a toxicological and microbiology examination to analyse if it is at all a case of poisoning or any disease but ended up without any evidence. The necropsy examination carried out by the team of veterinarians calculated that the elephants died between the late night of 11^{th} May and early morning hours of 12^{th} May, that is between 48 to 60 hours before necropsy based

on the passing of rigor mortis, post mortem autolytic changes in carcasses and size of maggots, etc. External examination of the carcasses demonstrated a bloated, discolouration of the skin, advanced decay with oedema under the skin and fluid oozing out from ruptured epidemics. Two of the carcasses had ruptured the abdomen due to post-mortem changes and bloat. One of the carcasses burst during the course of necropsy. Prolapse of the rectum, genitalia, dark coloured fluid from eyes, trunk and oral cavity were observed in all the 18 carcasses. All the carcasses were emitting crackling and crepitating sounds through rectal orifices. One of the carcasses had 'charred' marks over a part of the left ear pinnae and a linear burnt streak over the left shoulder blade. One of the carcasses has charred marks over the foot pad. Two carcasses were found with forage in their mouth and appeared 'dropped dead' while two of the calves were found dead under the sub-adult males. Four carcasses were in sternal recumbency with their legs folded in an unusual pattern. The veterinarians could not perform a detailed necropsy examination of the carcasses as they have already undergone advanced autolytic changes and all parenchymal organs lost their normal architecture.

A tree bearing signs of lightning was observed on the site. Moreover, chipping and peeling off strips of barks, and greying green colour of leaves with leaves rolled inward were also observed. Meteorological data and local information from the villagers indicate events of lightning – the report said.

It is worth mentioning Cooper *et al*., (2008) [3] here who estimated lightning fatalities due to step potential to be approximately 40 – 50 per cent in developed countries. On the other hand, John Jensenius, a lightning safety expert from NOAA explains that there may not be any visible signs on the animal themselves but some visible signs on the trees. In such a case, it is hard to know whether lightning struck based on the pictures, but there may be an animal among the dead that has visible signs, like a bit of charring on the skin (Chen, 2016) [2]. Though a few questions of the environmentalists remained unanswered the findings of the Deuri committee report seem to confirm the statement of Jensenius. All 18 elephants might have been killed by the ground current. First, there is a direct strike that hits the tree or may the ground nearby. The energy then spread along the ground surface, and the animals nearby absorbed it and got shocked to death.

Conclusion

It is not unusual to see farm animals or wild animals killed by lightning, but killing 18 gigantic elephants together is shocking and unprecedented. There are several case studies done on lightning effects on four-legged animals that discuss medical aspects of lightning injuries or injury mechanisms. Animals do tend to group in storms and huddle under trees. If lightning strikes the tree or somewhere nearby, the entire group can be killed. When animals are in groups, most are killed by the ground current. A direct strike hits a tree or nearby ground and energy then spread along the ground surface and the animals on the ground absorb it and get shocked. Lightning goes up one leg and down another. Animals are more vulnerable because their legs are spread out more and therefore ground currents travel more easily in their bodies. Thus, ground currents are found to be the thing that's responsible for the most lightning deaths and injuries. Side flash usually kills one or a small number of animals, not large ones like with ground currents.

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