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Before and After Effect of Forest Fires on Total Available Forage of Chital In Kosi Range, Ramnagar Forest Division, Uttarakhand

Abstract

Chital(Axis-Axis) deer is abundant in Ramnagar Forest Division of Uttarakhand. In this research paper relationship between Chital and Forest fires was investigated in Ramnagar Forest division by comparing the density of Chital before and after the forest fire, which in turn was proportional to available vegetation or forage. A positive correlation was found between chital density and the Forest fires i.e. the areas affected by Forest Fires invited a large population of chital by offering increased forage.

Keywords: Forage; Browsing; Grazing; Herbs; Shrubs, Rufus; Forbs; Stags.

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Introduction

The term forest is derived from Latin word 'Foris' which means outside. Today a forest is any land managed for the diverse purpose of forestry whether covered with trees, shrubs, climbers etc., or not (S.P. Sageriya, 1967). The forest biome includes a complex assemblage of different kinds of biotic communities. Optimum conditions of temperature and ground moisture responsible for the growth of fauna for the establishment of forest communities. forests are a critical regular asset that can possibly be economically collected and figured out how to yield a decent variety of items of financial significance. Wood is the most significant item gathered from forest. The wood is normally made into paper, timber, compressed wood, and different items.

Forest Fires and Their Effects

Forest fires are mainly of 3 types:

Crown Fire

These types of fires burn trees all the way up to the top. These are the heaviest and most dangerous wildfires.

Surface Fire

Only surface litter and duff burned by surface fires. These fires are the easiest to remove and cause the least damage to the forest.

Ground Fire

These type of fires (sometimes referred to as underground or subsurface fires) occur in deep accumulations of humus, peat and similar dead vegetation which become dead and dry enough to start an underground fire. These fires move very slowly, but they can be difficult to completely extinguish or suppress.

Out of all three, we can say that surface fires are beneficial for the forest as it enhances the soil organic matter for further growth of plants.

Chital

The Chital (Axis axis), otherwise called spotted deer or axis deer, is a type of deer that is local in the Indian subcontinent.By seeing through naked eyes male Chital is bigger than females. On an average male is about 90cm (35in) and females 70cm (35in) up to their shoulders, and weighs about 30-75 kg (males)and 25-45 kg (females). Their upper body portion is Red/Rufus in color, covered with white spots while the abdomen, rump, throat, insides of legs, ears, and tail are all white.

Ecology and Behavior

Chital is dynamic whole day, and they must live their life with all their senses at a high pitch. The fainted smell, the slightest sound or the briefest glimpse could give warning of an attack. The chital must detect their enemy before it takes them by surprise. Mostly in summers Chital

spent their days underneath the shades of green trees. When the animals rest or loiter slowly, activity slows down during midday. Foraging restarts late in the afternoon and continues until midnight. Few hours before sunrise, they fall asleep, usually in the cooler forest than the glades. These deer usually move on specific paths in a single file, with a distance of two to three times their width when traveling, usually in search of food and water sources. A study in the Gir National Park (Gujarat, India) showed that in the summer of all seasons chital travels the most.

At the point when investigating its region, the chital stands still and tunes in with attention, confronting the potential threat, assuming any. As an antipredator measure, chital escape in gatherings (dissimilar to the Hog deer that scatter on alarm). The running chital has its tail raised, uncovering the white underparts. The chital can jump and clear fences as high as 1.5 m (4.9 ft), however, likes to plunge under them. It remains inside 300 m (980 ft) of spread. Large herds were most common in monsoon, observed foraging in the grasslands. Predators of the chital include wolves, Bengal tigers, Asiatic lions, leopards, Indian rock pythons, dholes, Indian pariah dogs, and mugger crocodiles. Red foxes and golden jackals target juveniles. Males are less vulnerable than females and juveniles.

Diet

As we talk about Chital feeding habit they prefer grazing and frequently feed on green, short, sprouting grasses almost whole year, but we can see them browsing as in months of October to January when grass withered and no longer available for grazing. Chital also browse on forbs (an herbaceous flowering plant other than grass), green leafy shrubs, fruit and branches of trees, especially when they are thrown down by monkeys. Stags (male deer) will stand on their hind legs to feed on tree foliage.

Study Area

The Ramnagar forest division comes under the sub-tropical zone of Uttarakhand. In which mix type of forest is found with a variety of Sheesham, Teak (Sagaun) and Saal. Forest division lies on the western circle of Ramnagar forest department. It covers the area of 48736.90 hectares(487.36²km.), which is around 60 km long and 40 km wide. Its coordinates are 29°13min30sec and 29°32min40sec northern latitude and 79°5min50sec and 79°33min0sec eastern longitude.

Ramnagar forest division is distributed in 5 ranges, namely:

1. Kosi range
2. Kota range
3. Dichauri range
4. Kaladhungi range
5. Fatehpur range.

For this research out of the above 5 ranges, Kosi range was selected because it's a high Chital activity as well as fire-affected zone

Review of Literature

Previously, a number of studies were carried out by distinguished writers on forest fire in Uttarakhand and in different regions of Uttarakhand. Mainly there are two types of fires one is controlled (prescribed) which is ignite by forest department itself to minimize the intensity of forest fire and for promoting the growthof several plant species and second one is uncontrolled wildfires. I have gone through Cell Biology, Genetics, Molecular Biology, Evolution and Ecologyby P.S.Verma, V.K. Agarwal (reprinted 2009) in which they briefly describe the fire, types of fire and effects of fires.Forest fire in Garhwal Himalaya: A case study of mixed forests by S.C. Tiwari, K.S. Rawat, and R.L. Semwal, 1986 has also been consulted for this research paper.Adissertation on the topic "Effects of fire on the forest of Ramnagar Forest Division" is already done under the pre-Ph. D. course work.

Objectives of the Study

1. To study the effects of forest fire on plant biomass.
2. To estimate the total forage available before and after the forest fire season.

Methodology

All the study was done in Kosi range of Ramnagar Forest Division. Random sampling method was used to estimate forage available to deer before and after the forest fire. The forage was divided into 2 categories, grazing and browsing plants. Herbs (small low growing plants) and grass were taken into grazing andshrubs into browsing.

Estimating increase in Grazing Forage

Grazing plantmass increase was estimated by using digitalimage analysis. The percentage of green color in the image was taken directly proportional to the plant mass.

Increase in Herbs

Five random samples were taken in the month of February – March (before fire season) and other 5 in the months of late June – early July (after fire season) from the Kosi Range – a high Chital activity zone, in a 100 × 100 m^2patch. The images of these samples were digitally analyzed to estimate the average plant mass, before (February - March 2018) and after (August – September 2018) the forest fire season.

Table 1: Percentage increase in herbs

S.no.	% Herbs before Forest Fire	Average %Herbs before Forest Fire	% Herbs after Forest Fire	Average %Herbs after Forest Fire	Percentage Increase in Total Herbs mass
1	30.46	27.37 %	90.89	73.5 %	$\frac{73.5 - 27.37}{27.37} \times 100$ =168.5 %
2	26.63		55.17		
3	22.81		60.88		
4	23.39		93.11		
5	33.55		67.43		

Increase Ingrass

Five samples were taken from an open area in the Kosi range, before the forest fire, from an area of 100 × 100 m^2. Twigs and dry leaf matter were cleared to reduce errors. The images were analyzed to estimate the average grass mass. After the forest fire, the grass spread was taken to cover 95-98 % of the same land and the increase is then calculated.

Figure 4 Original Photo

Figure 5 Enhanced Photo

Table 2: Percentage increase in Grass

S.No.	% Grass before Forest Fire	Average Total %Grass before Forest Fire	Total %Grass after Forest Fire	Percentage Increase in Total Grass mass
1	26.61	27.19 %	98 %	$= \frac{98 - 27.19}{27.19} \times 100\%$ = 260.4 %
2	26.27			
3	28.41			
4	27.60			
5	27.06			

Browsing plant increase

Average plant (shrubs) weight was measured per square meter, by taking a circular patch and then weighing the obtained plants. The following was obtained from Kosi range – a high Chital activity zone.

Increase in Plant Mass

Table 3: Before Forest Fire: February - March 2018

Sample no.	Area (m^2)	Plant weight (kg)	Plant density (kg/m^2)
1	5.75	9	1.56
2	8.65	15.5	1.79
3	6.54	11	1.68
4	10.35	19.6	1.89

Average plant density = 1.73 kg/m^2 approx.

Table 4: After Forest Fire: August – September 2018

Sample no.	Area (m^2)	Plant weight (kg)	Plant density (kg/m^2)
1	7.25	18.5	2.55
2	12.65	30	2.36
3	6.45	13	2.02
4	8.5	24	2.82

Average plant density = 2.43 kg/m^2 approx.

Percentage increase in plant mass – 40.46 %

Estimating increase in Browsing forage:

A patchof approximately 100×100$m^2$was taken and the area covered by plants was estimated before and after the forest fires (trees and non-palatable plants excluded).

Table 5: Increase in browsing forage

Time	Average Plant Density kg/m^2	Percentage of the area covered by plants	Total Forage (Kg)	Percentages including plant densities
Before Forest Fire	1.73	60%	10380	24.95%
After Forest Fire	2.43	80%	19440	46.7%

Percentage increase in browsing forage – 87.28 % approx.

Results

1. Average plant mass increased by 40% after the forest fire. This was expected as the fertility of the soil increases due to an increase in organic matter in the soil.

Figure 1: Before forest fire

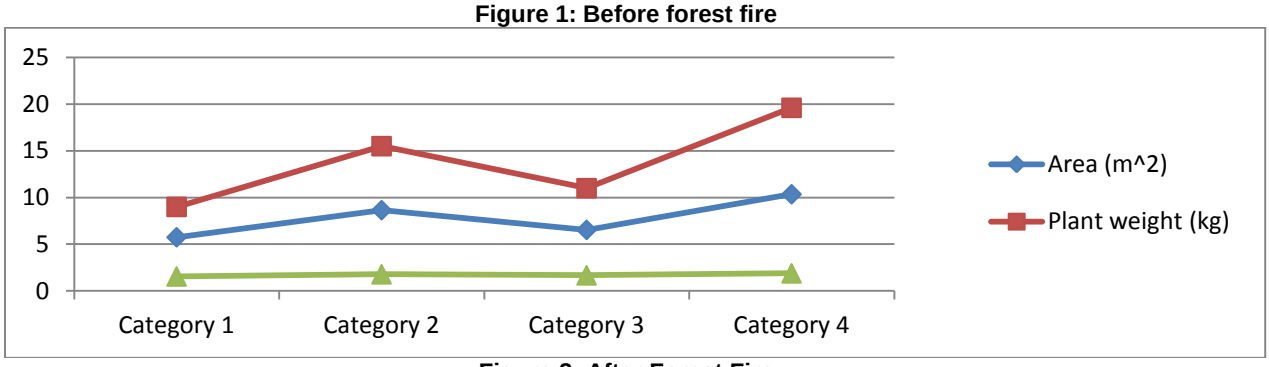
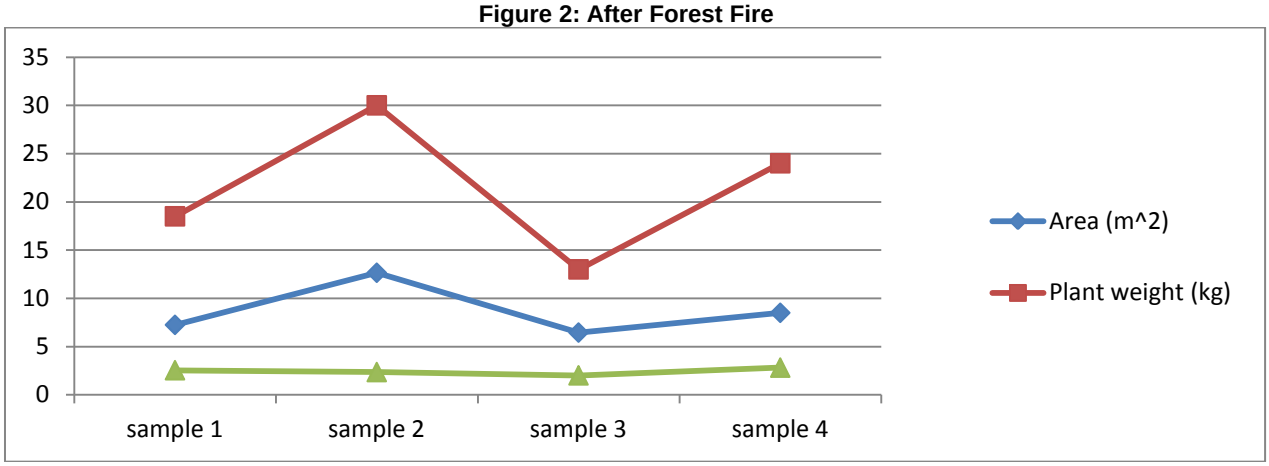
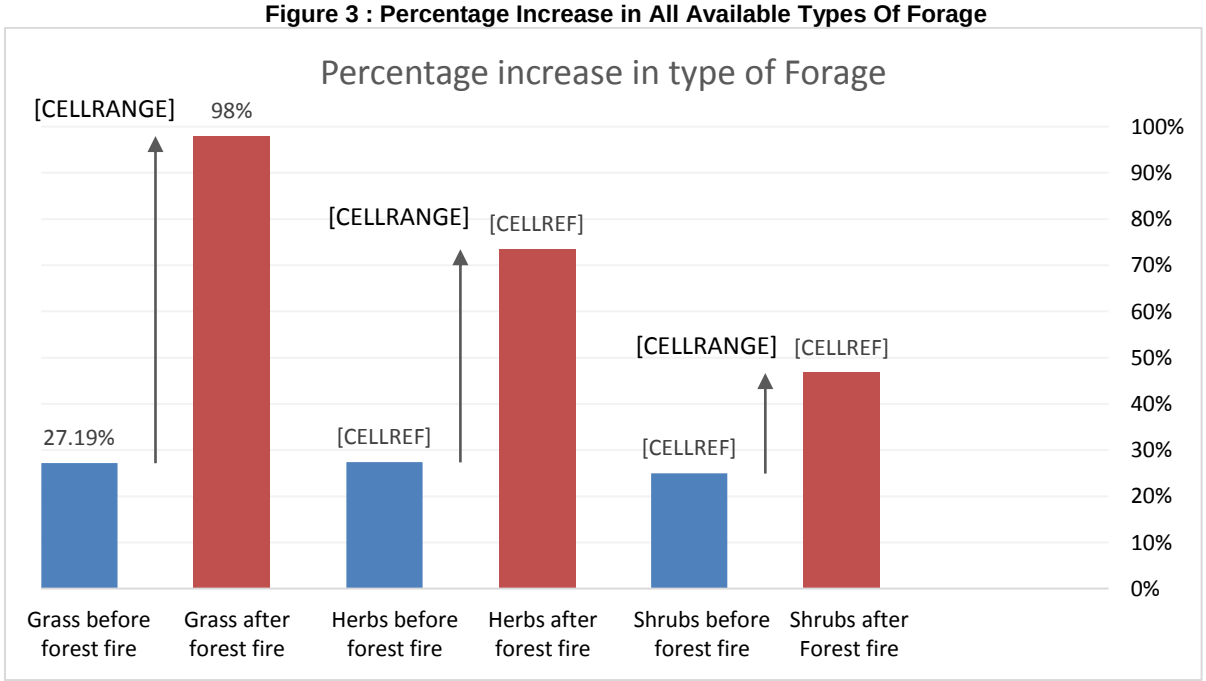


Figure 2: After Forest Fire



Percentage increase in all available types of forage on land is shown below:

Figure 3 : Percentage Increase in All Available Types Of Forage



Total Forage increase

Total Forage = Grazing forage + Browsing forage

Since browse forms the major portion of diet in October to January ($\frac{1}{3}$ rd. of total forage) when the grass isn't available,

% Forage increase = $\frac{2}{3}$ (% grazing increase) + $\frac{1}{3}$ (% browsing increase)

= $\frac{2}{3}[\frac{1}{2}$ (% grass increase) + $\frac{1}{2}$ (% Herbs increase)] + $\frac{1}{3}$ (% browsing increase)

$$= \frac{2}{3}[\frac{1}{2}(260.4\ \%) + \frac{1}{2}(168.5\ \%)] + \frac{1}{3}(87.28\ \%)$$
$$= 143\ \% + 29\ \%$$
$$= 172\ \%$$

Total forage increase by 172%**.** Hence increasing the Chital population in the Fire affected zone.

Conclusion

Above research shows that Forest fires have a positive impact on the ecology of Chital. Digital image analysis proved effective in estimating the total available forage. This method was also adopted due to itsnon-destructive nature as Ramnagar forest division is a protected zone. The total forage was increased by 172 % in the fire affected zone in which the grass portion of the forage increased by a whopping 260 %, herbs by 168 % and the browsing shrubs by 87 % approximately.

These fires do not pose a very big threat to The Chital. The Chital can run up to 50 kilometers per hour which is much faster than a fire which moves at about 1.2 meters a minute. Many people think forest fires kill many animals, which is not the case. The Chital just leaves the area until the smoke, and fire has cleared their habitat, then the Deer move back into their land. There is then a time period where food is very scarce due to the fire burning everything edible that the Chital could eat. The nutrient-rich ashes over the soil results in many new plants, which the Chital enjoys eating, starts to grow quickly in the soil due to the lack of competing plants. Predators leave the habitat to find food elsewhere giving time for the Chital population to grow and allow time for mating. Forest fires are in direct control of raising deer populations; Forest fires are very beneficial to the Chital.

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