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Study of Some Anthropogenic Activities with pace of Biodiversity Threat or Menace in Sariska Tiger Reserve

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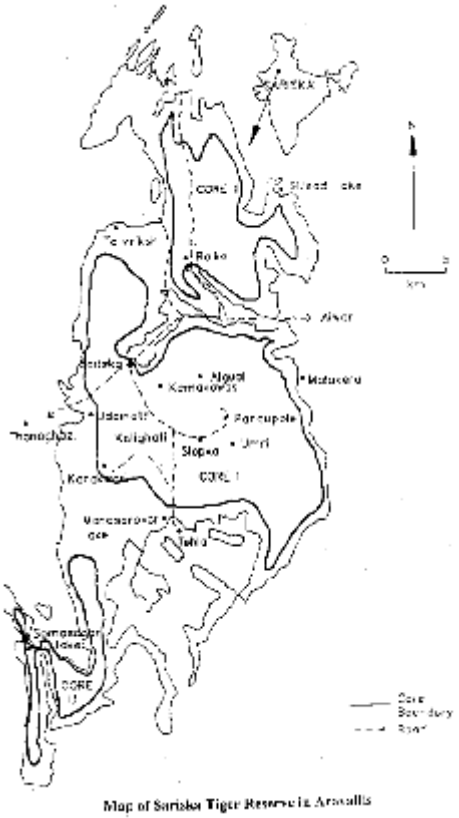
Abstract: ***The Sariska tiger reserve in Aravallis has its own importance and specific characteristics endowed with unique biodiversity. In the present study an attempt has been made to ascertain status of plant and animal species which is the healthy indicator for forest ecosystem. Attention is focused on one of the important reserve forest of state of Rajasthan with pace of their endemism and facing number of challenges in this reserve. Out of them the serious and cause concern are tourism, mining, human habitation, exotic or invasion of alien species, the encroachment, livestock grazing, agriculture grazing camps (Gwadas), loping for the collection of wood, is a serious problem and threat to biodiversity of the reserve area which is elaborated by several studies on various protected areas of India and World like Anon, 1989, Agarwal, 2000, Andren,1994, Andrew,1990,Beier, Noss,1998, Bennett1991Brody, and Pelton1989, Garcia. and Scatena,1994Forman,and Alexander,1998 McKinney and Michael, 2002, Zube, and Busch, 1990. The menace and threat to due to anthropogenic activities is one of cause concern and severe impact on the pristine biodiversity.***

Keywords: Biodiversity, Sariska tiger reserve, Aravallis, Anthropogenic activities, Menace and Threat

1. Introduction

According to the Champion and Seth (1968) the forest of Aravalli region falls under the broad category of Tropical Dry forests. Study area the "Sariska Tiger reserve" (74°14´ to 76° 34´ N and 25° 5´ to 27° 3´ E) is situated in the Aravalli hill range and lies in the semi-arid part of Rajasthan (Rodgers and Panwar, 1988). It became a wild life sanctuary in 1955 and Tiger reserve in 1982. According to Department of Forest, Government of Rajasthan the total area of the Sariska Tiger Reserve is 866 sq.km, of which 302.2 sq. km. is buffer zone and 497.8 sq.km is core zone. Sariska core zone is comprised of three isolated; pockets: Core-I (273.8 sq.km), II (126.5 sq.km.) and III (97.5 sq.km). The status of the Core I has been notified as a National park in 1982. Sariska is undulating to hilly and has numerous narrow valleys. Kiraska and Kankwari plateau and two large lakes Mansarovar and Somsagar. Silisad lake is situated just along the north eastern boundary of the reserve. The altitude of Sariska varies from 540 to 777 meters. The vegetation of Sariska correspond to Northern tropical dry deciduous forests (sub group 5 B; 5/E I and 5/E2) and Northern tropical thorn forest (Sub Group 6 B) (Champion and Seth,1968). The forest being scattered and sparse over a large area on various geological and soil formation and vary greatly in composition. Sariska is very rich in biodiversity with wide spectrum of flora and ample of wild life. The main economically valuable species are dhok (*Anogeissus pendula*) salar (*Boswellia serrata*), khair (*Acacia catechu*), bamboos (*Dendrocalamus strictus*), dhak (*Butea monosperma*), kair (*Capparis decidua*), ber (*Zizyphus mauritiana*) with having lot of ground flora comprised of shrubs, herbs, grasses and sedges etc. The forests being scattered and sparse over a large area on various geological and soil formations, vary greatly in composition. In the valleys where better soil and moisture conditions exist, the vegetation is comparatively denser.*Anogeissus pendula* is the dominant tree species, covering over 90 percent area of the forests. *Boswellia serrata* and *Lannea coromandelica* grow on rocks and dry slopes. *Acacia catechu* is common in valleys, where *Dendrocalamus strictus* is extremely limited and are found along well drained reaches of the streams and moist and cooler parts of the hills. The trees are generally slow growing an attain poor height. *Albizia lebbeck, Diospyros melanoxylon, Syzygium cumini, Tamarindus indica* and *Ficus* spp. which are found in moist localities attain large size both in crown grows gregariously, where valleys fan out. and becoming flat and wide.A total number of 403 indigenous and naturalised plant species belonging to 271 genera under 86 families can be observed in Sariska Tiger Reserve.



Map of Sariska Tiger Reserve in Aravallis

2. Material and Methods

Personal observations were taken in the field by visiting the study area and its different landforms including core and buffer zone of the forest. It was a great help that the field staff of Sariska Tiger Reserve, Department of Forest, Government of Rajasthan was associated always in the field. Interview has been taken for counter check of their utility by local dwellers inside or outside the reserve. The impact on biodiversity visualized during intense survey, and photographs has been taken and their feasibility inside and outside the reserve were observed on the toposheet 54/A with help of line and vehicle transects and quantify these impact accordingly.

3. Result and Discussion

In the present study an attempt has been made to find out the current status of interaction between the environment existing biodiversity and anthropogenic activities. Results in this study includes information related to existing biodiversity in the given study area and various anthropogenic activities *viz*. tourism, mining activities, human settlements and habitation, grazing camps (Gwadas), loping for the collection of wood, livestock grazing, poaching, encroachment, introduction of exotic species, development of waterholes, and agriculture. Results associated with above activities are mentioned here in table a to p. During the tenure of this study several activities were observed affecting the existing biodiversity. Tourism and impact on Biodiversity: Tourism in reserved forest has been developing as an attractive proposal. A rapid race is going on among the countries for increasing earnings through tourism. However tourism is observed as a one of the factors affecting the environment and the biodiversity. Table(a) shows different places of the tourist attraction located within the Sariska Tiger Reserve. These are ranging from religious to historical monuments.Table(b) shows the number of tourists visited Sariska Tiger Reserve annually between 1991 to 2003. The number of tourists visited Sariska Tiger Reserve ranged between 15503 to 72972 in years 2000-01 and 1996-1997. During this study period the maximum tourist turn out was 59,438 in the year 2001 to 2002.It indicates that maximum pressure of tourism prevails during September to February for foreigner and nationals.

Table (a): Places of tourist attraction in STR

Types of Anthropogenic activities	*Places of Sariska Tiger Reserve*	*Inference*
Tourism and other disturbances	Garh Rajor temple, Nilkanth Mahadeo temple, Pandupole temple, Talvriksh temple, Naraini mata temple Ajabgarh fort Bhangarh fort Sariska palace Kankwari fortress Tehla fortress Kalighati and Siliserh lake	Situated in the core zone of Sariska Tiger Reserve as well as in buffer zone of reserve forest area. Pressure of tourism intensified in core area I and core area II

Table (b): Shows the list of the number of visitors STR

Year	No. of visitors of STR
1991-92	50509
1992-93	58256
1993-94	56310
1994-95	58410
1995-96	58442
1996-97	72972
1997-98	63962
1998-99	56191
1999-2000	54987
2000-01	15503
2001-02	59438

Source: Management plan and status paper of Sariska Tiger Reserve, 2002.

Table(c) includes the professional category of the tourist of domestic and international nature. Table (d) includes the purpose of domestic and international visitors in Sariska Tiger Reserve. Table (e) shows that number of visitors in different group size visited Sariska Tiger Reserve.

Table(c): Number and categories of tourists (Domestic and International) in STR

Tourists	Services	Business	Doctors	Students	Agriculturist	Others	Total
Domestic	167 (33.3%)	143 (28.6)	16 (3.2)	48 (9.5)	63 (12.7)	63 (12.7)	500
International	44 (44)	6 (6)	0	6 (6)	0	44 (44)	100

*Values in parentheses represent percentage of total

Table (d): Purpose of the visitors during visit of STR

Tourist	Trekking	Wildlife viewing	Educational tour	Photography	Pilgrimage	Total
Domestic	159 (22.2%)	56 (7.8%)	32 (4.4%)	56 (7.8%)	413 (57.6%)	716
International	81 (41.7%)	38 (19.5%)	19 (9.7%)	25 (12.8%)	31 (15.9%)	194

Table (e): Number of the visitors in different group size at STR

Tourist	Single	2 to 4	5 to 8	9 to 12	>12	Total
Pilgrims	16	135	175	48	55	429
Nature tourist	8	87	48	16	24	183

Mining Activities and impact on Biodiversity: The Aravalli hills are reported to be one of the oldest reported hills so far. According to the feed back from departments pertaining to mines and minerals both at state and national level, Aravallis are richest source of minerals and happened to be back bone of industries of a state. We have been witnessing disputes among people, environment and forest and mining department. This is basically because of lack of planning and unsustainability and under the circumstances ecological

balance is gradually losing. Biodiversity is gradually eroding. Eventually there is systematic erosion of genetic basis of usable species; Table (f) includes the major spots of mining in the study area. The buffer zone of Sariska Tiger Reserve protected areas have 128 leased areas of limestone, slatestone, marble, iron, copper, granite, quartzite, shales, barytes and masonary stones.Table (g) includes the name of the forest blocks and number of the mining leases and status of the forest area.

Table-(f): Major spots of mining in the STR

Anthropogenic Activity	*Places of Mining in Sariska Tiger Reserve*	*Status / occurrence inference*
1. Mining activities	Jaganathpura Nagalhedi Lakhedi Kalwar Palpur Baldeogarh Malana Jhiri Tehla Dabkan Khoh/Dariba Gordhanpura Khokalwad	Mining blocks are situated in the buffer zone of Sariska Tiger Reserve protected area. Total lease area are 128 for various minerals like, limestone, slate stone, marble, iron, granite, quartzite, shale, barytes and masanory stone

Table (g): List of mining leased areas located in the forests blocks of STR

	Name of the forest blocks	*Number of mining leases*		Status of forest
		Completely	*Partially*	
1.	Jaganathpura	36	05	Protected area (Buffer zone)
2.	Nagalhedi	04	-	Protected area (Buffer zone)
3.	Lekadi	01	-	Protected area (Buffer zone)
4.	Kalwar	53	22	Protected area (Buffer zone)
5.	Palpur	08	07	Protected area (Buffer zone)
6.	Baldeogarh	75	03	Protected area (Buffer zone)
7.	Mallana	38	06	Protected area (Buffer zone)
8.	Jhiri	04	04	Protected area (Buffer zone)
9.	Gordhanpura	04	-	Protected area (Buffer zone)
10.	Tilwar	-	03	Protected area (Buffer zone)

Human settlement and impact on Biodiversity:In terms of ecology the social scientist consider those human being living within the reserved forest as ecosystem people. Ecosystem people don't disturb the ecological balance. They have been living in harmony with the flora, fauna and the environment; hence biodiversity remains unchallenged and unthreatened rather safer in the presence of ecosystem people. But in the present study area it was observed that the number of human settlements within the reserved forest area is higher than the sustainability limits. Table (h) includes places of the major settlement within Sariska tiger Reserve. Table (i) the villages referred on human settlement in Sariska Tiger Reserve can be observed on Toposheet. Table (j) and (k) shows the list of revenue villages and forest villages.

Table (h): Places of the major settlement within Sariska Tiger Reserve

Type of Anthropogenic activities	Places in Sariska Tiger Reserve	Status inference
Human settlement and habitation	Kankwari Amara ka bas Thanaghazi Umri Kiraska Baleta Prithvipura Nandu Madhogarh Karna Ka Bas Indok Kalakhora Talbriksh Balmudiyawas Duharmala Naldeshwar Bhrathari, Rotkyala and Udainath	Associated settlement in core area I and its buffer zone of protected area
Human settlement and habitation	Chandol Gopalpura Kalikhol Binak Jhir Raika and Talbrikrh	Associated settlement in core area IInd and its buffer zone of protected areas
Human settlement and habitation	Serawas Bandipul Rundh Dulawa Bhagani Umri Kankwari Kirashka Haripura Alguwal Karna ka bas Sukhola Ajabgarh and Gola ka bas	Eleven major habitat of human settlement are situated in the core area of Sariska Tiger Reserve. Only one Karna ka bas is completely displaced. Four villages like Bhagani 32.4 hectare, Umri 88.4 hectare, Kankwari 187 hectare, Kiraska 152 hectare will be displaced soon as per order of Hon'ble Highcourt of Rajasthan.
Human settlement and habitation	Bhangarh Naraini Kharit ka bas Dhiroda Poata Sili bawari Khoh Haripura Garh Nilkanth and Dabkan	Associated villages in core area III and its buffer zone of protected area

Table (i): Includes the list of villages shown on the toposheets 54A/6, A/7, A/8,A/11

Name of villages	Zone	Status
Bharthari	Buffer	Revenue
Nahar sati temple	Buffer	Revenue
Ramsara	Buffer	Forest
Nilkanth	Buffer	Revenue
Mandalwas	Buffer	Revenue
Manyawala	Buffer	Revenue
Khairit ka bas	Buffer	Revenue
Naraini ji temple	Buffer	Forest
Nathusar	Buffer	-
Khoh	Buffer	-

Berawas	Buffer	Forest
Raika	Buffer	Revenue
Nawal ki dhani	Buffer	Revenue
Khawas bawari	Buffer	Revenue
Lalpura	Buffer	Revenue
Serawas	Buffer	Forest
Talbriksh	Buffer	-
Indok chota	Buffer	Revenue
Guarah charalu	Buffer	Revenue
Sherond	Core I	Forest
Haripura	Core I	Forest
Lilunda	Core I	Forest
Rotkala	Core I	Forest
Kund	Core I	Forest
Esala	Core I	Forest
Pandupole	Core I	Forest
Slopka	Core I	Forest
Alguwal	Core I	Forest
Kalighati	Core I	Forest
Pilapani	Core I	Forest
Bakala	Core I	Revenue
Gawara	Core I	Revenue
Panidal	Core II	Forest
Dulab	Core II	Forest

Table (j): List of Revenue villages in Sariska Tiger Reserve

Name of villages	Approximate number of peoples
Madhogarh	1065
Kushalgarh	350
Indok	1213
Kala chhara	174
Nagalhedi	380
Bairawas	417
Duharmala	370
Rekhamala	150
Kundal ka bas	135
Karna ka bas	NA
Kaniyawas	NA
Mithrawat	175
Rajor	655
Garh	121
Umri deori	375
Kiraska	347
Ryotwala	165

Table (k): List of Forest villages in Sariska Tiger Reserve

Name of villages	*Approximate number of peoples*
Kankwari	225
Umri	375
Haripura	125
Bhagani	415
Lilunda	NA
Sukola	175
Sheronds	NA
Rotkala	NA
Siliberi	453
Pilapani	392

Grazing camps and impact on Biodiversity: State of Rajasthan very often experiences drought condition and during the drought period wildlife faces severe starvation tragedy which sometimes leads to large scale morality. During such phases Non Governmental Organisation, local people and department of forest has been to shouldering the responsibilities of saving the lives of wildlife and hence grazing camps are organized very often. This phenomenon is refered as Gwadas . Then these livestock's in turn was observed to be grazing in the forest and damaging biodiversity.

Table (l): Gwadas during the study period observed in Sariska Tiger Reserve.

Types of Anthropogenic Activities/Associated	*Places of Sariska Tiger Reserve*	*Inference*
Grazing camps/Gwadas	Kanakwari Umri Haripura Lilunda Sukola Rotkala Slopka	All these villages are situated in core area I The main occupation of the peoples are animal husbandary for that they have to collect dry biomass in the form of grazing camps

Cultivation and impact on Biodiversity: Several surveys and field visits were conducted to find out the impact of cultivation on biodiversity in the study area. Agriculture is one of the known anthropogenic activities affecting negatively the existing biodiversity. The damage caused to biodiversity due to agriculture is severe than any other activities because the area cleared for cultivation fully clears even the seed banks. Thus the chances of regeneration of biodiversity are finished for once and all.

Table (m): List of major places of cultivation in Sariska Tiger Reserve**.**

Cultivation	Kirashka (Core area I) Buffer adjacent to core area I Indok Umri Deori Amara Ka Bas Jodhawas Kaniyawas Rajor Kushalgarh Nandu Prithvipura	Situated in buffer area of Sariska Tiger Reserve having agriculture practices at subsistence level.
Cultivation	Madhogarh Kalikhol Binak Jhiri Akbarpur Gopalpura Duharmala Bakhtpura Dhehalwas Kalyanpura Talbriksh Khar Gadi Manawas Baiyarwas Nangalheri Barah Kalachhara	Situated in buffer zone of core zone II. Agriculture practices at subsistence level
Cultivation	Govindpura Bhikampura Ajabgarh Bhangarh Dhiroda Dabkan Khoh/Dariba	Situated in protected area of Sariska Tiger Reserve core zone III agriculture is quite intensive due to some water harvesting units.

	Kalwar Palpur Tilwar Dabla Baldeogarh	

Lopping for fuel wood and impact on Biodiversity: Lopping is identified as yet another activity affecting the existence of biodiversity. Mainly lopping is done for collection of fuelwood and fodder for the livestocks reared by local people. The process of lopping directly affects primary productivity of the area since the twigs are removed from the plants along with the leaves and leaves are the sites of photosynthesis. Major areas are affected by lopping for fuel wood and fodder mentioned in table (n).

Table (n): Major areas which are affected by lopping for fuel wood and fodder collection

Lopping for fuel wood	Siliserh Kalachhara Udainath Umri Nandu Tehla Dabkan Kanyawas Kalawad Rajor Garh Ajabgarh	Situated in buffer zone at Sariska Tiger Reserve shows intensive illegal lopping
Fodder collection	Haripura Umri Lilunda Sukola Rotkala Alguwal Kankwari Kirashka	Inside the core area of Sariska Tiger Reserve, collects dry fodder biomass to develop camps. So the regeneration of forest is very poor and in scattered form

Grazing by Livestocks and impact on Biodiversity: Grazing is reported to be an activity which has potential to damage biodiversity. The existence of livestock is directly associated with human population. In the present study during the field visits it was observed that intensive grazing is done at several place in the Sariska Tiger Reserve. If the due to increase number in livestocks more than the carrying capacity, biodiversity is affected in irreversible manner.

Table (o): Area with intensive grazing by livestock in Sariska Tiger Reserve

Live stock grazing *In situ*	Kirashka Kankwari Umri Haripura Deori Serawas Bandipul Rundh Dulawa Bhagani Alguwal	Intensive grazing occurs around surrounding area of protected areas. Degraded barren land occurs.
Live stock grazing *In situ*	Madhogarh Kushalgarh Bani Talvriksh Todi Nirjan Kirawas Jodhawas Kala Chhara Indok Raika	Situated in and adjacent to the buffer zone of Sariska Tiger Reserve represent degraded forest due to grazing of livestocks

Introduction of Exotic Species and impact on Biodiversity: Climax community of a given area is a result of interaction, interdependence, and interrelations between the living organism and their respective environment among the populations of the climax community over a long period of time. Thus there is a close intimacy between the species and their respective habitat to the extent that some of the species become endemic to the given area. This is the characteristic feature of specific habitat that they are harbouring large number of endemic species per hectare. It is quite unfortunate that there is systematic removal of indigenous species. They are not allowed to regenerate due to formation of approach roads and agricultural activities. The barren land created due to elimination of indigenous species is covered by exotic species. It is advocated that exotic species are fast growing and producing fuel wood. As a matter of fact introduction of exotic species exerts pressure allelopathic and allelochemically on soil and ultimately on indigenous species. During the field surveys in the study area a number of exotic species were observed spreaded in different places in Sariska Tiger Reserve.

Table (p): Some of the exotic species observed in Sariska Tiger Reserve.

Type of Anthropogenic pressure	Places in Sariska Tiger Reserve	Inference
Introduction of Exotic weed like *Adhatoda vasica*	Haripura in core zone I Kiraskha in core zone I	Massive spread of exotic weeds in these areas by the help of cultivated plants and domestic animals
Argemone maxicana	Karna Ka Bas Bharathari Slopka Alguwal	An obnoxious weeds spread out by the help of livestock grazing
Lantana camara	Pandupol	Limited to moist wet area
Cassia tora and *Parthenium* sps.	Species found along the Nallas around the Sariska palace, Bharathari temple, Talvriksh and adjoining areas	These species occurred by the help of the livestock grazing or fodder collection practices
Prosopis juliflora	Almost entire Sariska and its adjoining area	*Prosopis juliflora* is one of the most importat afforestation species on Aravallis became an obnoxious weeds.

Introduction of disastrous epedemic diseases like Haemorrhagic septicaemia Foot and mouth diseases and Rinderpet	Dispersed location according to livestock grazing like in Haripura, Kiraskha Umri, Deori, Slopka etc.	Decreases in the number of herbivores, wild ungulates like chital, sambar, nilgai, etc.

4. Conclusion

In this study emphasis was laid on anthropogenic activities which effects the biodiversity of reserve inside and outside the Sariska Tiger Reserve .The study revealed that the loss of biodiversity of the study area due to anthropogenic activities *viz*. tourism, mining activities, human settlements and habitation, grazing camps (Gwadas), loping for the collection of wood, livestock grazing, poaching, encroachment, introduction of exotic species, development of waterholes, and agriculture like encroachment leads in habitat fragmentation and loss, which have impact on flora and fauna. These activities lead to dissociate the reserve area into patches and simultaneously the migration of fauna is restricted, which reflects in their biological clocks and feeding or breeding behavior. Due to the human interference in reserve will lead to deterioration the quality of air and noise pollution which culminate the behavioral condition of the wildlife in the reserve. So to regain the sacred and pristineness of the reserve no interference at any cost shall be advocated for that rehabilitation programes are on the way.

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