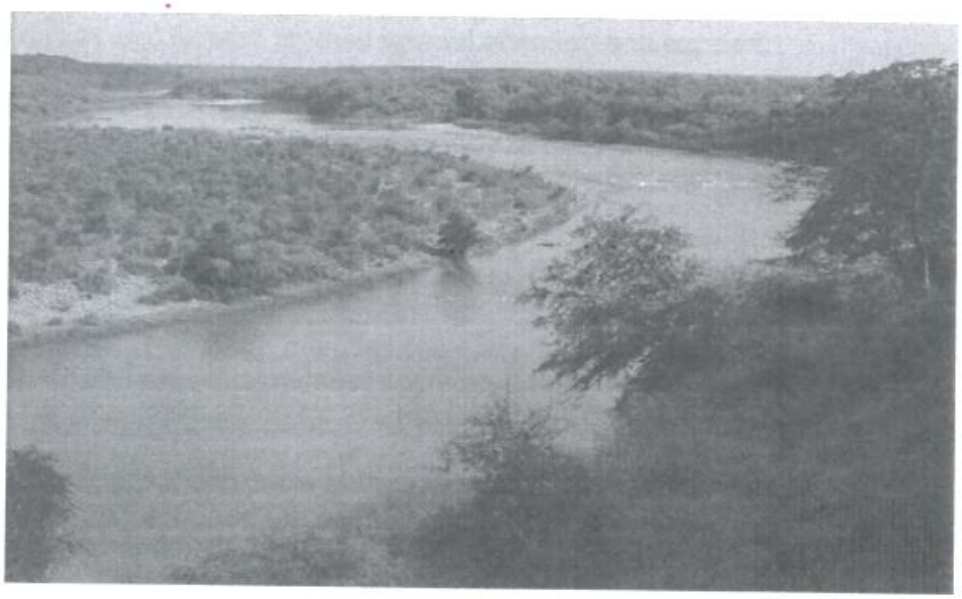
Monitoring Wildlife Population And Habitat Assessment In The Proposed Lion Introduction Site - Kuno Wildlife Sanctuary, Madhya Pradesh, India



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Contents

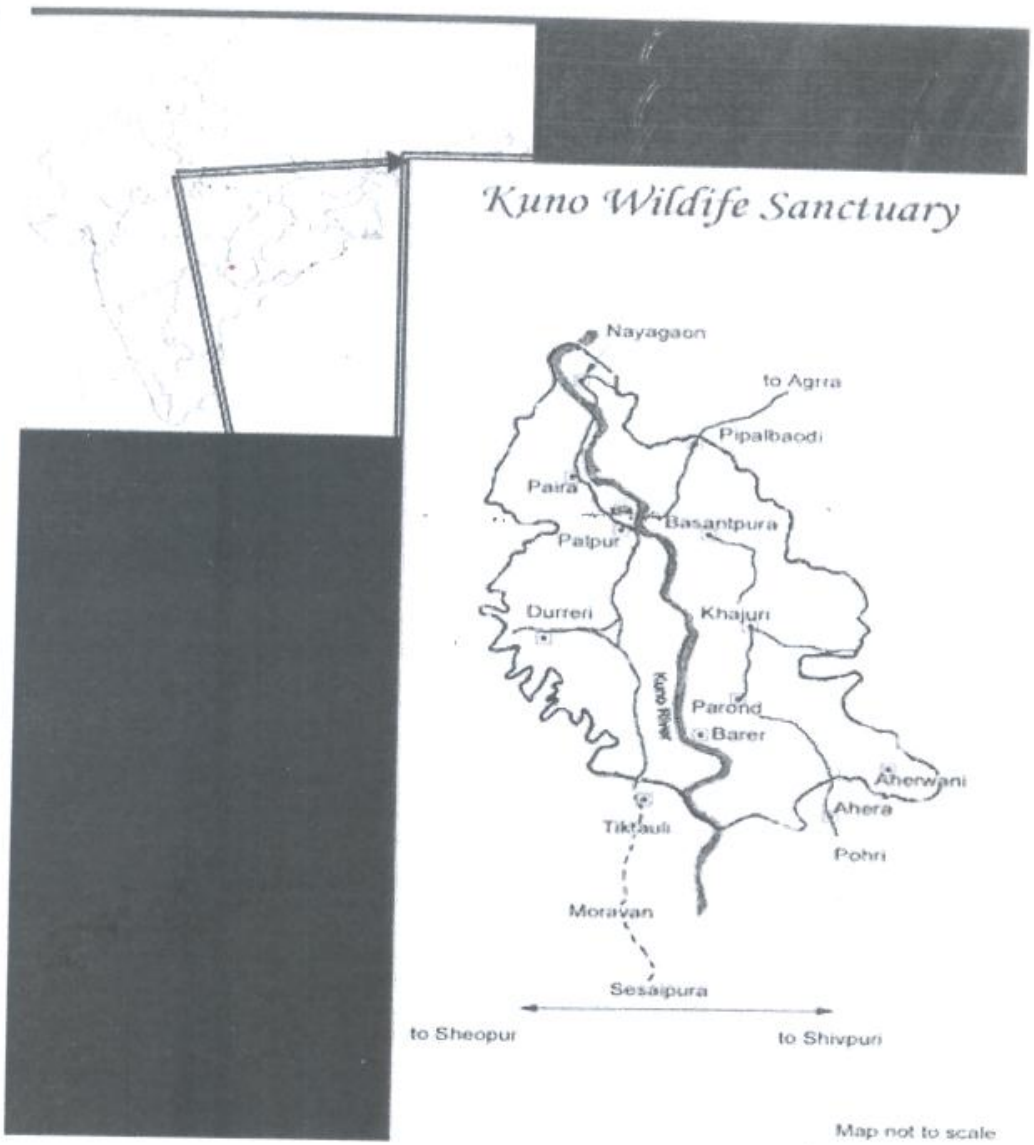
(3)

Introduction:

Many of India's wildlife species are threatened with extinction due to widespread habitat destruction and poaching. To realize evolutionary potential, survival and to promote genetic vigour, it is desirable that wildlife populations should be widely distributed through out their original geographical range (Soule, 1987). Thus the reintroduction concept was developed to ensure a long-term survival of the species by creating new free ranging populations in areas from where the species had totally disappeared in the past (Sale, 1986).

Today, Gir National Park and Sanctuary is the only site in the world holding free-ranging Asiatic Lions (*Panthera leo persica*). The population descended to its lowest number in 1893 when only 18 individuals remained (Saberwal *et al.* 1994). Since then it has shown a remarkable recovery (Sinha, 1987 Chellam, 1993 and Jhala and Qamar, 1999). If a small population of large carnivores is restricted to a single site, it faces a variety of extinction threats (Soule, 1987). Therefore, this free ranging population of Asiatic lions of Gir forest is one of the most threatened populations of large carnivore in the world and requires immediate measures to ensure its long term survival. Recognizing the threat to this population, after an extensive survey of several potential areas, the Wildlife Institute of India short-listed three areas as possible introduction sites for this population. These were Darrah - Jawaharsagar and Sitamata Sanctuaries in Rajasthan and the Kuno Wildlife Sanctuary in Madhya Pradesh. A rapid but detailed assessment of these sites was carried out and Kuno Wildlife Sanctuary (KWS) in northwest Madhya Pradesh was found to be most suitable location for trans-locating Asiatic lions from the Gir forest to establish a second free-ranging population in India (Chellam *et al.* 1995). Once successfully introduced, this second Asiatic lion population will increase the chances of survival of this highly endangered subspecies.

The Kuno Wildlife Sanctuary is located between latitudes $25^0$30'-$25^0$53'E and longitude of $77^0$07'-$77^0$26'N, in the Sheopur district of Madhya Pradesh. About 924 sq. km. of the surrounding forest habitat has been brought under a single management unit with the Sanctuary area of 344.686 sq. km^2. The total area of 1269 km2 is now managed to host the introduced lion population. The forest of KWS falls under the Northern Tropical Dry Deciduous Forest category (Champion & Seth, 1968) and is dominated by *Anogeissus*



pendula, A. latifolia, Boswellia serrata, and *Acacia catechu* with extensive Savannah woodland forming an ideal habitat for the Asiatic lion. The river Kuno runs through the

5

Sanctuary and it is the main source of water during the arid summer months. The major prey species for lion in the Wildlife Sanctuary are Chital *Axis axis*, Chinkara *Gazella bennettii*, Sambar *Cervus unicolor*, Blackbuck *Antelope cervicapra*, Nilgai *Boselaphus tragocamelus*, Four-horned antelope *Tetracerus quadricornis*, Wild pig *Sus scrofa* and Common Langur *Semnopithecus entellus*. Leopard *Panthera pardus*, dhole *Cuon alpinus* and Grey Wolf *Canis lupus* are the main carnivores and occasionally tiger is also reported from this region.

After KWS was selected as the site for translocation of the Asiatic lions, one of the first tasks undertaken by the Kuno Wildlife Sanctuary management was the rehabilitation of the 24 villages from the sanctuary to new sites outside the protected area. This will create a large forest habitat free from human disturbance for the lions. Village rehabilitation is complete and now the focus is on habitat recovery and wild prey population to support the introduced lion population.

There were no systematic scientific study done in KWS other than the exploratory survey conducted to assess the area for lion introduction (Chellam *et al.* 1995). Recently, Madhya Pradesh Forest Department, in association with the Wildlife Institute of India was initiated capturing of crop raiding nilgai as a part of prey base supplementation program at the KWS. This pilot study was undertaken to standardize techniques for the mass capturing of nilgai and prepare protocols for trans-locating them to KWS (Khudsar *et al.*2001).

The present study was an attempt to begin the systematic monitoring of wildlife populations in KWS and assess the recovery of habitat recently made free from biotic pressure.

The objectives of the proposed study:

1. Monitoring of habitat recovery after the village rehabilitation program.
2. Monitoring of wildlife population and feral cattle populations and its impact on habitat recovery.
3. To suggest measures to halt the growth of feral cattle population.
4. Create baseline ecological information for management

Methodology

Monitoring of habitat recovery after village rehabilitation program

To assess the habitat recovery and to determine the spatial abundance of wild herbivores of the Sanctuary its entire area was grided on the toposheet at every minute on longitude (1.68 km) and latitude (1.85 km) lines. At every minute, on both direction points were marked on the topo-sheet. These points were used as the site for plots to monitor the habitat and abundance. These marked sites were visited with the help of a Global Positioning System (GPS) and were identified with a unique numerical code. At each of these sites three plots of 10x10m were marked and detailed information was collected by enumerating number of tree species, girth at breast height (GBH), and counts of shrubs, saplings and seedlings. Disturbance and information on other ecological factors were collected which included cutting, lopping and grazing, and distance from nearest water source and road.

Data were analyzed using Shannon- Wiener Function to know the species diversity. Similarly, tree density, Shrub density and canopy cover were analyzed in excel.

Monitoring of wildlife population and feral cattle populations and its impact on habitat recovery

A) Population estimation of wild prey species

Distance sampling (Anderson *et al.*, 1979) is one of the widely used methods for estimating wild animal populations. This method considered very effective and reliable for ungulate density estimation in India (Karanth 1992, Varman and Sukumar 1995; Khan *et al.*, 1996) and has many advantages over other methods employed in the subcontinent. Road transect was used to monitor and estimate herbivore densities in the KWS.

The existing roads were used as vehicle transects to estimate prey densities. Regular and intensive monitoring of these roads by a jeep travelling at a speed of < 20 km/hr with two observers allowed us to cover larger distances at shorter time and obtain increased sightings of animals. For each animal sighting on transect following data were recorded

1. Species
2. Number
3. Age
4. Sex
5. Minimum distance from the road to the centre of the animal group

We used laser range finder to estimate perpendicular distance from the line

B) Population estimation of feral cattle:

As part of the preparation for the introduction of Asiatic lion, the Kuno management 24 villages were successfully rehabilitated from within the sanctuary to outside. A large population of cattle was left behind by the villagers at their respective villages. This feral cattle population forms a substantial herbivore biomass and is potential prey for the large carnivore population of the Sanctuary. This population can grow fast and would compete with wild prey population and can affect the recovery of the habitat after the relocation of the villages. Therefore it was important to assess the size of this feral cattle population. Considering the important ecological role of this population in KWS, a detailed survey was conducted of every identified yarding site. In addition to this population were assessed by distance sampling method.

Result and Discussion:

Vegetation Sampling:

Tree diversity was very uneven especially in the evacuated agricultural field. There were no significant changes observed. However shrub diversity has shown significant differences showing better regeneration after relocation of villages. A decline in shrub diversity in the evacuated agricultural field was observed because of growing trees due to reduction in various biotic pressures.

A remarkable recovery was observed in tree density. Some of the sites such as Palpur, Barru nalla, Togra, Ladar etc. were taking up quickly. Shrub density was observed increasing in the evacuated agricultural field of Jakhoda and Choti Khajuri area. *Zyziphous nimmularia* was found to be colonizing in the evacuated field, increasing the shrub density.

Canopy cover was not seen changing significantly except in the evacuated agricultural field where woodland was found to be developing slowly where *Acacia lecophloea* were taking up well.

Estimation of wild prey population

Though my project was supported by the board for five months only which is inadequate to come to meaningfull ecological conclusion, I have been working in this area for last many years and hence I have used my earlier data as a baseline to make this report ecologically sound

There was remarkable recovery observed in the herbivores population. It was probably due to removal of villages and reduction in the grazing pressure. It was documented in several case studies that herbivore populations were shown significant recovery after removal of biotic pressures (Karanth & Sunquist, 1992; Panwar, 1991; Khan *et al.*, 1996). In Gir, chital population was increased by 1320% in 19 years (Khan *et al.* 1996), whereas in Kanha, it was the highly threatened *Cervus duvauceli branderi* (Gopal,1995) which benefited from such management interventions.

. Table 1. Estimated density of wild ungulates (Collected in 2004)

Species	Density/ sq km	Density cv %	95% confidence	
			LCL	UCL
Chital	6.61	15.40	4.882	8.97
Chinkara	3.62	14.30	2.736	4.803
Nilgai	0.77	23.60	0.489	1.231
Sambar	0.30	31.60	0.163	0.557
W. Pig	0.79	38.90	0.373	1.682

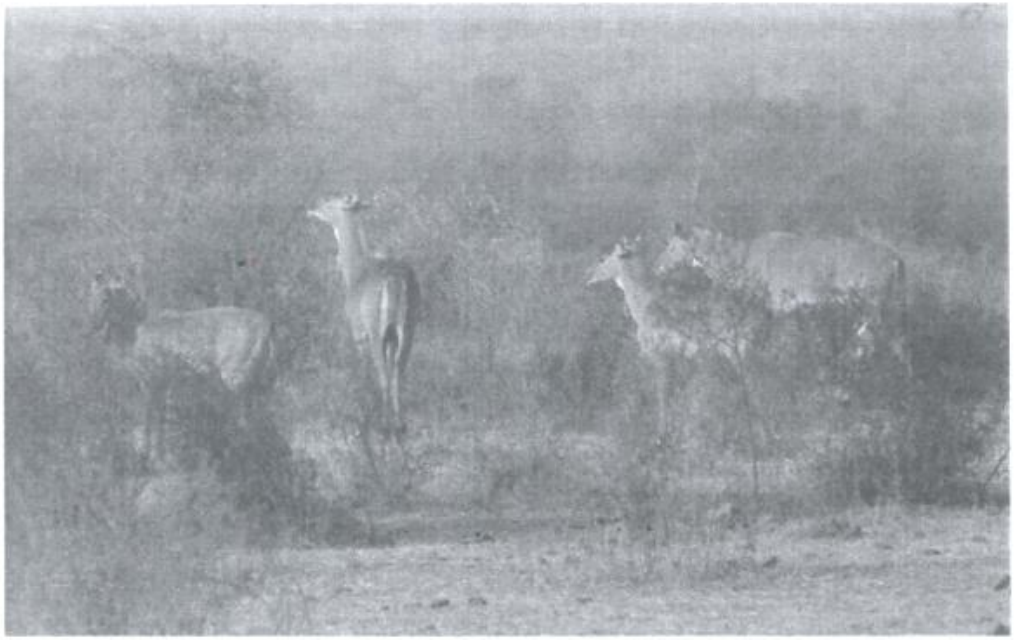


Table 2. Estimated density of wild ungulates (2006)

Species	Density/ sq km	Density cv %	95% confidence	
			LCL	UCL
Chital	12.25	0.31	6.37	23.55
Chinkara	6.52	0.25	3.86	10.99
Nilgai	1.61	0.42	0.66	3.90
Sambar	0.78	0.58	0.24	2.50
W. Pig	3.19	31.16	1.72	5.93
Cattle	39.37	0.45	16.66	93.04

Feral Cattle Population

A large feral livestock population is one of the important factors for the fast recovery wild prey populations in KWS. A controlled cattle population would result in significant increase in the forage availability especially for chital by providing them with improved access to their preferred habitats with ample ecotone and perennial water sources (Mishra, 1982). Therefore, a close monitoring of feral population and implementation

(Mishra, 1982). Therefore, a close monitoring of feral population and implementation measures to control its growth was an important management consideration. Feral population could at best be considered as a supplementary prey base, whereas efforts to develop a wild prey base large enough to support the introduced lions should be given the highest management priority.

Feral cattle population was shown an increasing trend over the period of time. Growing population was also observered occupying various habitat type for foraging though it was not evident that the wild herbivores population was being affected.

2004	2006
1934	2638

To suggest the measures to halt the growth of the feral cattle population

It was observed that a regular monitoring of feral cattle population was very crucial to find out the recruitments. Probably in couple of years it would be possible to find out the exact trend. Today population was not showing any significant impact but cattle coming from Rajasthan and other area into the KWS were completely stopped since last four years. Probably, it was the biggest achievement of the forest department which led to the encouraging trends in the wild prey population. If cattle population will show exponential increase in future, bull sterilization and some other strategies need to be implemented.

Baseline ecological information for the management

Since this study was first systematic scientific study carried out in the KWS, all vegetation data, prey base estimation as well as estimation of feral cattle population has been utilized by the Kuno management. Besides, frontline staffs were traind for ecological data collection and now they easily collect data for both the line transects and vehicle transects. They have also been trained to utilize Global Positioning System and to collect vegetation data.

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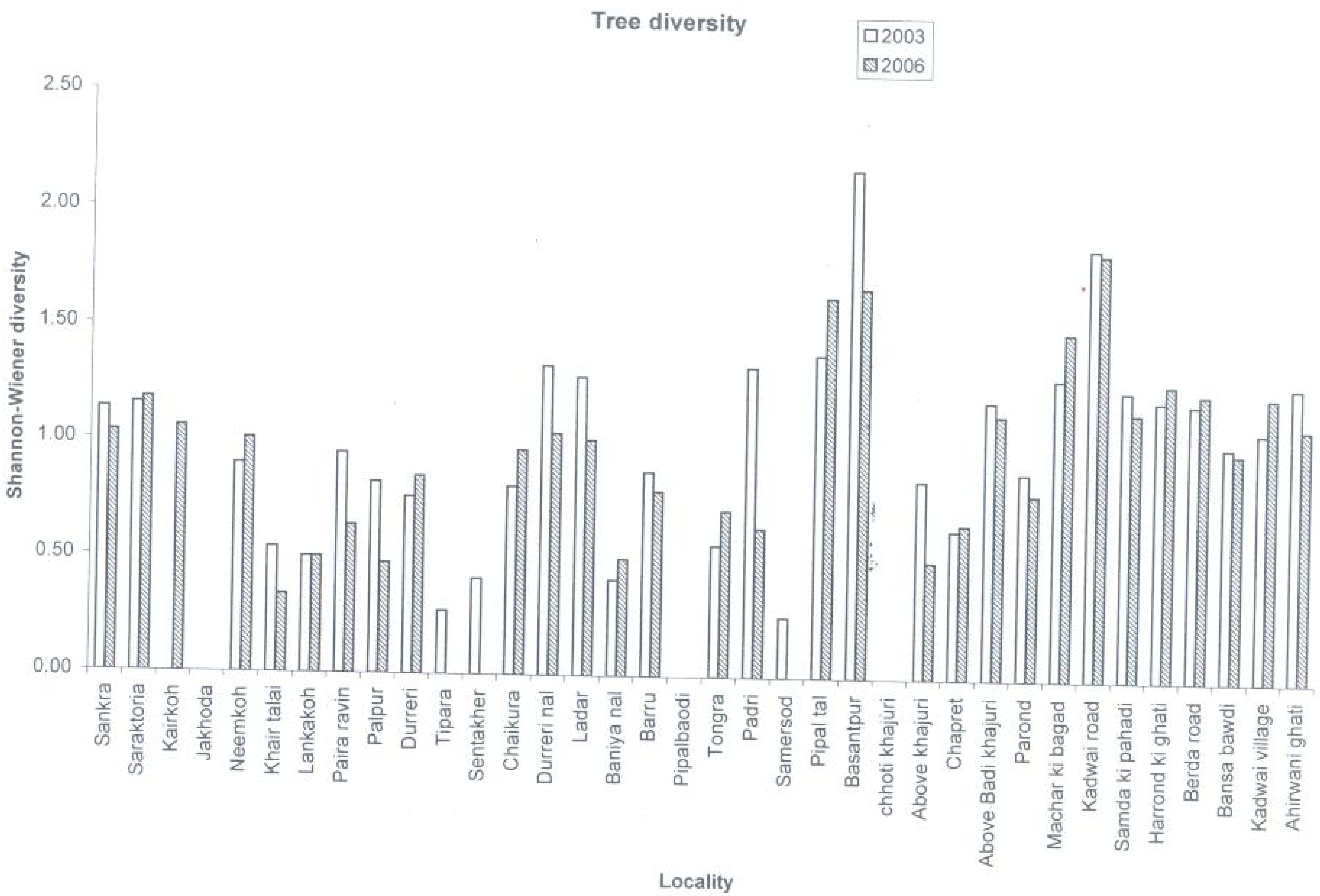
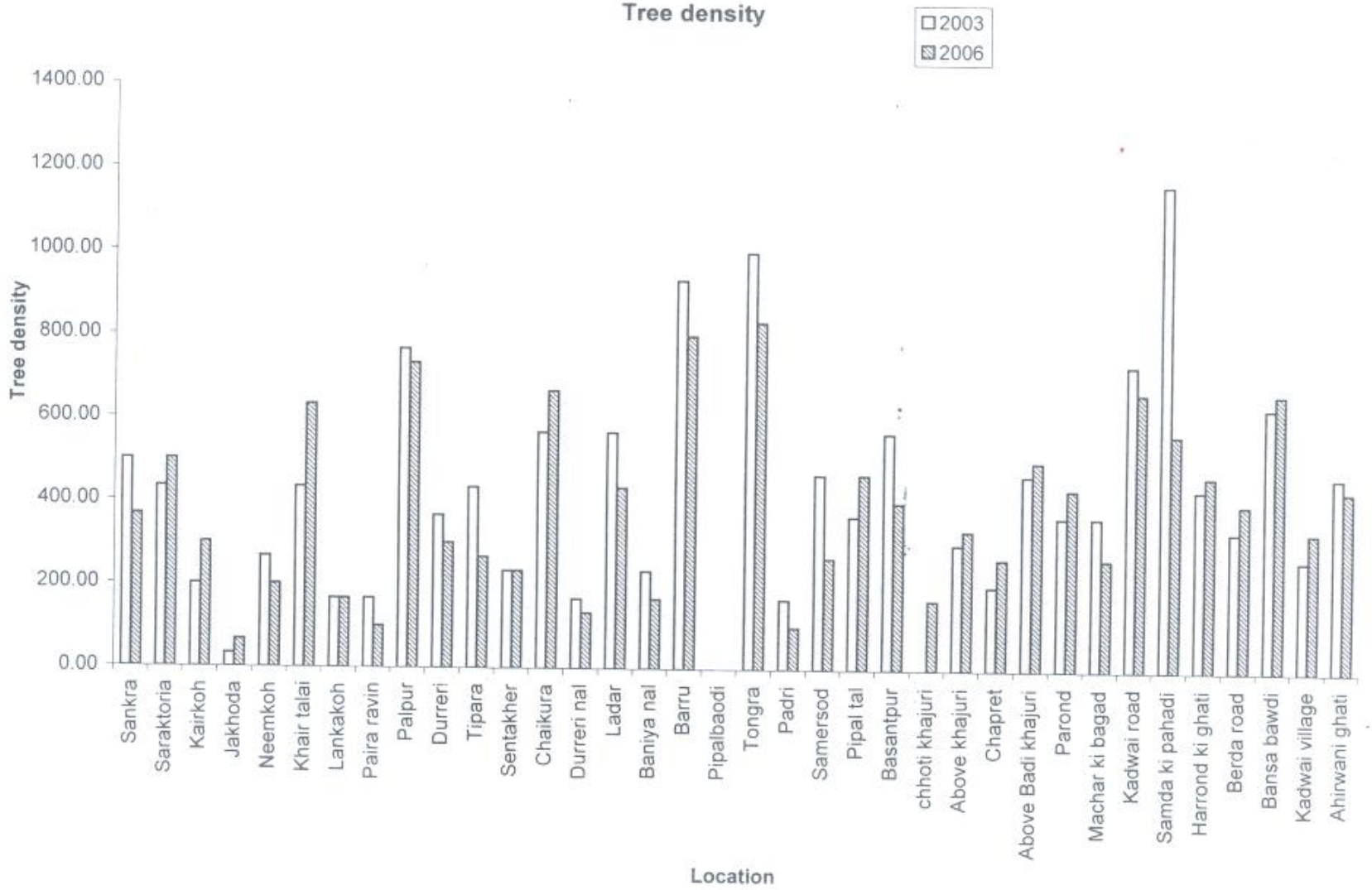
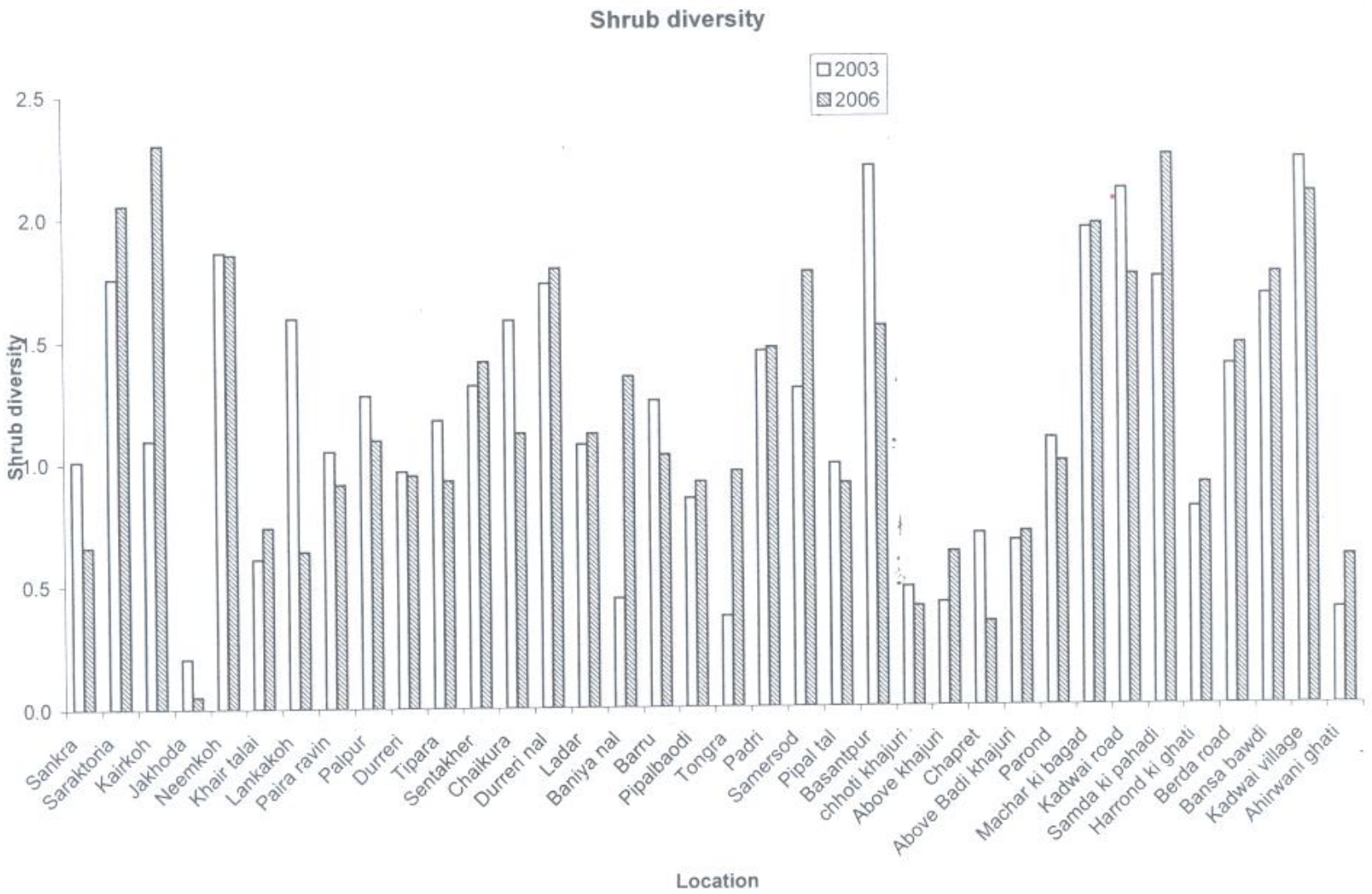
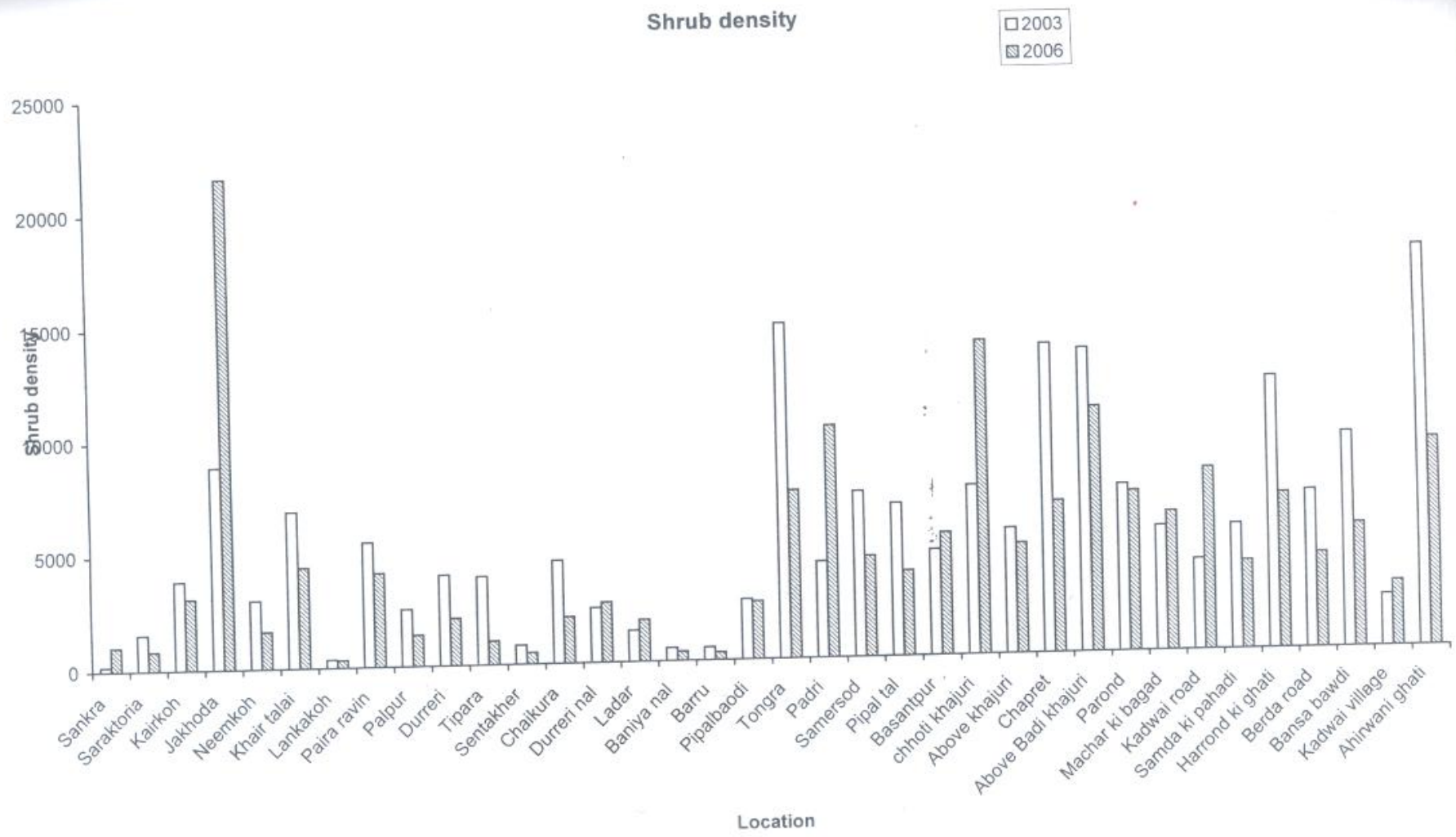
Appendix



Tree diversity
2003
2006
Shannon-Wiener diversity
2.50
2.00
1.50
1.00
0.50
0.00
Sankra
Saraktoria
Kairkoh
Jakhoda
Neemkoh
Khair talai
Lankakoh
Paira ravin
Palpur
Durreri
Tipara
Sentakher
Chaikura
Durreri nal
Ladar
Baniya nal
Barru
Pipalbaodi
Tongra
Padri
Samersod
Pipal tal
Basantpur
chhoti khajuri
Above khajuri
Chapret
Above Badi khajuri
Parond
Machar ki bagad
Kadwai road
Samda ki pahadi
Harrond ki ghati
Berda road
Bansa bawdi
Kadwai village
Ahirwani ghati
Locality


Tree density
2003
2006
1400.00
1200.00
1000.00
800.00
600.00
400.00
200.00
0.00
Tree density
Sankra
Saraktoria
Kairkoh
Jakhoda
Neemkoh
Khair talai
Lankakoh
Paira ravin
Palpur
Durreri
Tipara
Sentakher
Chaikura
Durreri nal
Ladar
Baniya nal
Barru
Pipalbaodi
Tongra
Padri
Samersod
Pipal tal
Basantpur
chhoti khajuri
Above khajuri
Chapret
Above Badi khajuri
Parond
Machar ki bagad
Kadwai road
Samda ki pahadi
Harrond ki ghati
Berda road
Bansa bawdi
Kadwai village
Ahirwani ghati
Location


Shrub diversity
2003
2006
2.5
2.0
1.5
1.0
0.5
0.0
Shrub diversity
Sankra
Saraktoria
Kairkoh
Jakhoda
Neemkoh
Khair talai
Lankakoh
Paira ravin
Palpur
Durreri
Tipara
Sentakher
Chaikura
Durreri nal
Ladar
Baniya nal
Barru
Pipalbaodi
Tongra
Padri
Samersod
Pipal tal
Basantpur
chhoti khajuri
Above khajuri
Chapret
Above Badi khajuri
Parond
Machar ki bagad
Kadwai road
Samda ki pahadi
Harrond ki ghati
Berda road
Bansa bawdi
Kadwai village
Ahirwani ghati
Location


Shrub density
2003
2006
25000
20000
15000
10000
5000
0
Shrub density
Sankra
Saraktoria
Kairkoh
Jakhoda
Neemkoh
Khair talai
Lankakoh
Paira ravin
Palpur
Durreri
Tipara
Sentakher
Chalkura
Durreri nal
Ladar
Baniya nal
Barru
Pipalbaodi
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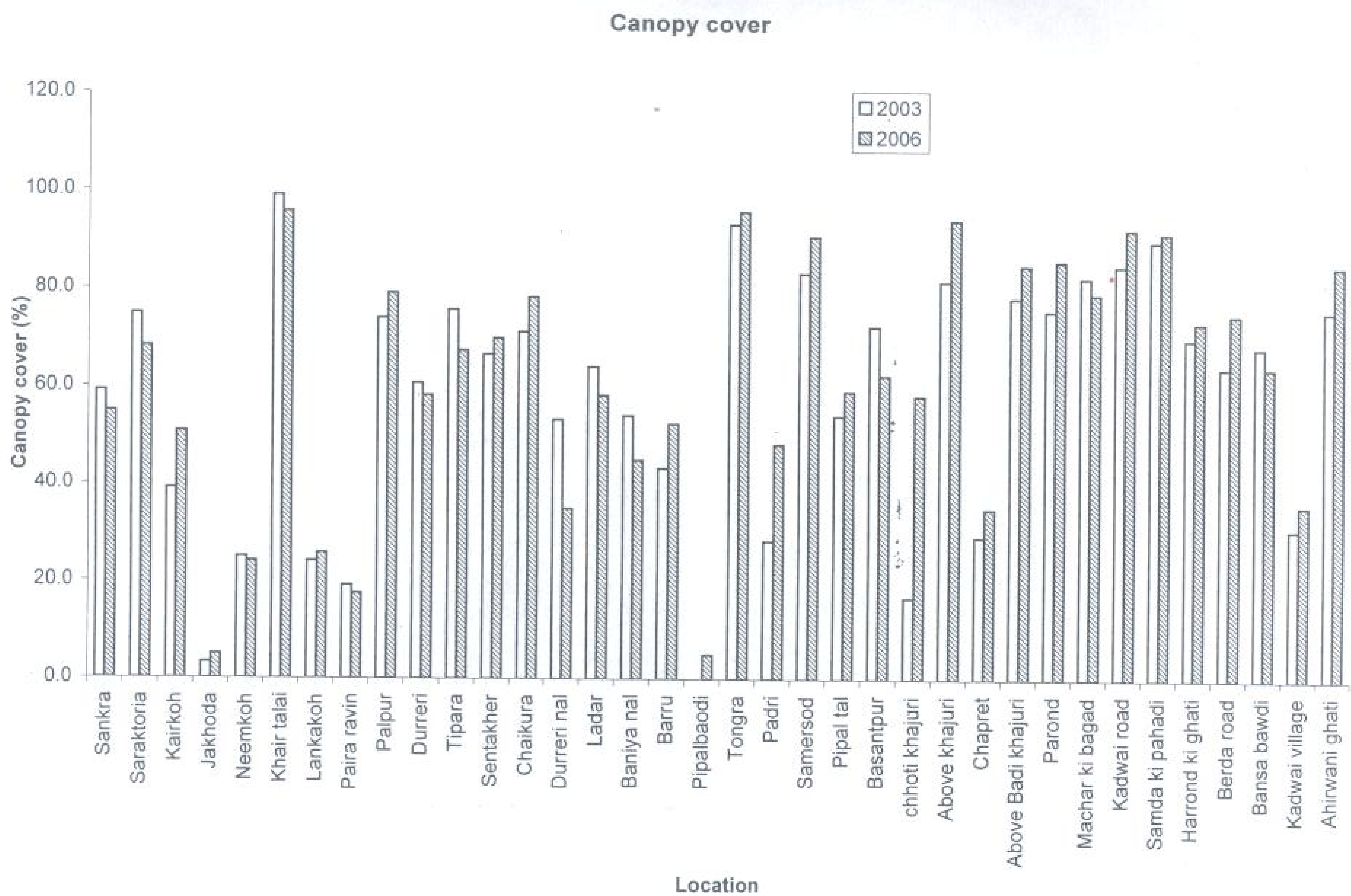
Location


Canopy cover
2003
2006
Canopy cover (%)
120.0
100.0
80.0
60.0
40.0
20.0
0.0
Sankra
Saraktoria
Kairkoh
Jakhoda
Neemkoh
Khair talai
Lankakoh
Paira ravin
Palpur
Durreri
Tipara
Sentakher
Chaikura
Durreri nal
Ladar
Baniya nal
Barru
Pipalbaodi
Tongra
Padri
Samersod
Pipal tal
Basantpur
chhoti khajuri
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Above Badi khajuri
Parond
Machar ki bagad
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Bansa bawdi
Kadwai village
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Location