

The members who participated in the Maha- Kho study.

1. ABHAY ANTURKAR
Add: 5, SHRINIWAS BHUSHAN
20, NEELKAMAL SOC. KARVE NAGAR
PUNE - 411052 PH: 25468260
2. TRISHANT SIMLAI
Add: B-1, PHASE-2, TUSHAR GARDENS
AUNDH, PUNE – 411027 PH: 27401056
3. SUSHIL CHIKANE
Add: 84/165, UTTAM SOC, BLOCK B
SHASTRINAGAR, KOTHRUD, PUNE – 411029 Ph: 56260641
4. KALYANI JATHAR
Add: 992/993/23, RAJENDRA NAGAR
SHREE BUNGALOW, PUNE – 411030 PH: 24539747
5. GIRISH PUNJABI
Add: 39, SHANKARSHET RD
17/354 MEERA SOC, PUNE - 411037 PH: 26450432
6. KAUSTUBH NIRANJANMULAY
Add: PARVATI, PLOT NO 20, MADHAVBAUG HSG SOC
PAUD RD, KOTHRUD, PUNE – 411038 PH: 25458246
7. CHINMAYA KULKARNI
Add: 103, SAPODILLA, MARIGOLD, KALYANI NAGAR
PUNE – 411014 PH: 40044993
8. SANAYA BHARUCHA
Add: 4/50, GURUPRASAD SOC, BUND GARDEN RD
PUNE – 411001 PH: 26123472
9. NIKITA KAUSHAL
Add: 6, PASHAN GREEN, RAMNAGAR COLONY,
NDA ROAD, PUNE – 411 021 PH : 22961825
10. ROHAN CHOUKKAR
Add: SECTOR 24, PLOT 73, PCNT, NIGDI
PUNE – 411 044 PH: 27655722
11. VISHNUPRIYA HATWAR
Add: 28, BHCS LAYOUT, BTM IInd STAGE,
BANARGATTA ROAD, BANGALORE – 560076
12. DEEPAK CHATURVEDI
Add: BHARATPUR
13. ANIRUDH CHAOJI
Add: FLAT No. 20, AKSHAY SAHANIVAS,
LANE 11, SHAHU COLY, KARVENAGAR
PUNE – 411 052 PH: 65611577

Project Maha - Kho

**Dedicated to the
Maha-Kho valley
whose rich biodiversity
will always
inspire our spirit of
wilderness exploration.**

PUGMARKS TEAM

**Abhay Anturkar, Chinmay Kulkarni,
Nikita Kaushal, Trishant Simlai,
Sanaya Bharucha, Girish Punjabi,
Sushil Chikane, Kalyani Jathar,
Vishnupriya Hathwar, Kaustubh Mulay,
Rohan Choukhar, Deepak Chaturvedi,
Anirudh Chaoji**

PUGMARKS

Discover your planet.
Discover Yourself

i. Preface

As a part of the Tiger Watch - Forest Department programme, our group of volunteers from Pugmarks - Pune, were placed in the Sawai Mansingh Wildlife Sanctuary in the Ranthambotre Tiger Reserve.

This report is an attempt to study the different facets of bio-diversity of the area in a short span of thirteen days. The main stress however, was on tracking the local leopard population - in the absence of any tiger movement in the area.

While most of the work was carried out in the Maha-Kho chowky, some references are also made of observations at the Khedi and Kalibhat chowkies.

Broad objectives of the Programme;

- In the absence of the tiger in this area, study the leopard population.
- Document the bio-diversity of the region.
- Study the man-forest interaction in the region of immediate interface.
- Learn about the anti-poaching efforts of Tiger Watch

We wish to thank:

- Shri. Fateh Singh Rathore, Shri. Dharmender Khandel and Shri. Vakil of Tiger Watch for organizing this programme.
- Shri Shekhawat (DCF) for supporting the programme and finding time to discuss the various facets of Forest Management with the team members during his visit to the Maha-Kho chowky.
- The staff of Forest Department, Ranthambore Tiger reserve and Kalibhat Chowky for making our stay comfortable.

ii. Distribution of study areas

The different objectives of our programme were distributed amongst the team members.

Table of Activities

1. Biodiversity studies

- | | |
|--|----------------------------------|
| ■ Study of <i>Geology</i> | Nikita, Sushil |
| ■ Leopard Tracking | Anirudh, Sushil, Sanaya, Kalyani |
| ■ Biodiversity Study | Sushil, Trishant, Sanaya, Nikita |
| ■ Study of Vulture Roosts | Rohan, Girish, Sanaya, Chinmay |
| ■ Study of Trees | Anirudh |
| ■ Watershed Management | Chinmay, Rohan |
| ■ Construction of Waterhole | Group exercise |
| ■ Problems of Prosopis | Anirudh |
| ■ Study of scat | Nikita, Kalyani, Sushil |
| ■ Study of scavenging and Nest robbing | Group exercise |

2. Social issues

- | | |
|--|----------|
| ■ Man-Animal conflict | Trishant |
| ■ Forest Dependence | Nikita |
| ■ Economic study | Rohan |
| ■ "Their Forest" | Chinmay |
| ■ Impact of Grazing cattle on regeneration | Anirudh |

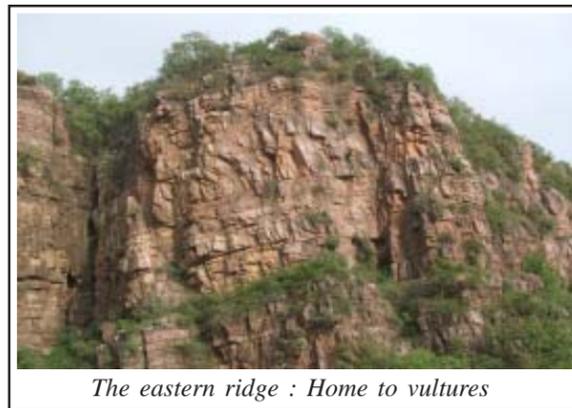
1. Ranthambore - Insight into the general geography.

The name Ranthambore itself refers to the Geography of the area. There are 2 hill-range which meet in this forest – the Vindhya and the Aravallis. The last hill structure of the Vindhya is called “Ran” while the last hill structure of the Aravallis is called “Thambhor”. Hence the name Ranthambore.



The pristine Maha - Kho Valley

We were stationed at the Maha-Kho Chowky located in the Sawai Man Singh Sanctuary which lies to the south east of the Ranthambore National Park. This Chowky was built about a year ago along the Maha-Kho stream. The chowky stands next to the stream between the western and the eastern ridges which are about 350-400 feet high. To the north, as we go upstream, the ridges come closer together to form a kind of



The eastern ridge : Home to vultures

enclosed valley. It has one of the only perennial sources of water. These ridges are essentially made up of 2 groups of rocks



Monsoons approach on Maha - Kho

which are the Ranthambore and the Intrusive. The rock system mainly consists of Dolerite and Mandalgarh Quartzite with Shale and Slate giving it the characteristic layered appearance. The Ranthambore and the Intrusives lie in the Bilwada Super Group and they belong to the period between Archaic and the Lower Protozoic Age.



The Maha - Kho valley in the rains

These craggy ridges are a perfect habitat for birds like the long-billed vultures. The water attracts mammals like leopards, civets and jungle cats .

The caves found in these ridges are home to the bats, swifts, swallows and martins. On top of these ridges there are table-lands interspersed with waterholes and rock structures, which are home to the chinkara and the neelgai.

Several lesser animals and insects like scorpions, spiders and tiger centipedes can be found. A number of frogs, toads, crabs and water gliders can be found in the small pools of collected water.

These high ridges have lovely forest gorges below. This entire area is used by the Hanuman langurs as their personal playground.

As we move south from the chowky, the area is like a plane extending outwards from both sides of the stream.

In this area we see typical trees like the dhok and acacia forming the plains of arid scrub forest. While in the region around the Chowky, dhok trees are interspersed with banyan and peepal trees forming a mixed deciduous forest.

This area gets an annual rainfall of about 800 mm. This rainfall results in heavy surface run off which has been taken care of by the Watershed Management Program up to some extent.



Life of the forest... Hanuman Langurs



*Death in the forest...
A road kill - Monitor Lizard*



Rains bring feast: A rat snake on the prowl



Sloth bears' favourite a Tendu tree



A delicate palm fern

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

2. Tracking the elusive cat - the leopard.

Leopards have always proven to be the most elusive of all the big cats. Maha-Kho valley offered no different experience. The thirteen days spent there were all lived with the leopards in the immediate surroundings – yet always giving us the slip.



Knock.. knock. Are you home???

The alarm calls of the prey species, leopards calls, pugmarks, scat, scat cover-up marks, bones of the prey, a den in the rocky crags, scratch marks on trees, aided us in observing the movement of the leopards.

However, for all practical purposes, we could collect distinct tracings and POP casts for only two individual leopards in the Maha-Kho valley. One was a large female with a paw length of 9.2 cms and stride of 119 cms. The other was a smaller male with a paw length of 8.2 cms and a stride of 93 cms.

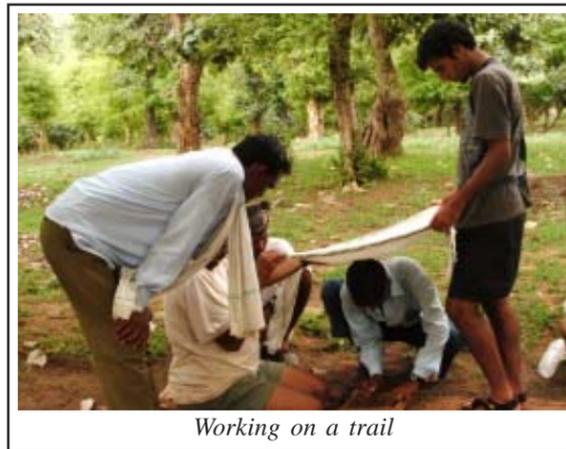
The case of the encounter with a probable third leopard and cubs could not be authenticated as there was no way to determine its separate identity in the absence of any pugmarks in the rocky terrain that it was encountered.

We did not have any direct sighting of leopard in the Maha-Kho valley. However, we had sighting of a female leopard at *Khedi*

chowky (aprox 5 kms. away). Another male leopard made a kill near *Kalibhat* chowky (aprox. 3 kms away) and was sighted by the chowky staff in the mid morning.

To track the leopard, the following methods were used :

- **Tracking the Pugmarks:** The various paths provided soft soil which showed the pugmarks of the animals. We also prepared “soft soil pug pads” by spreading soft soil on the various routes suspected to be used by the leopard. Every evening, after the cattle left the forest, we walked with brooms to level the “pug-pads”. Early next morning, the pads were studied. We observed the pugmarks of leopards, civets, porcupines, blue bulls, Indian gazelles, langurs and hares.

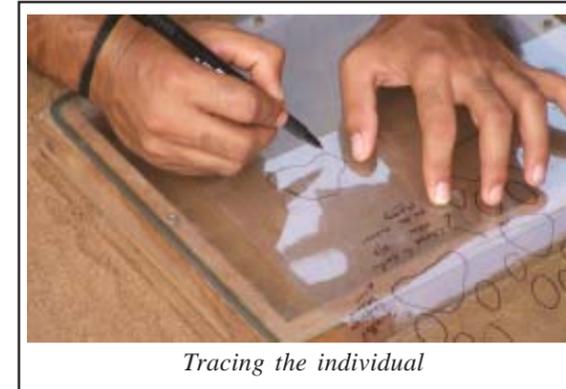


Working on a trail

- **Taking Tracings of the Pugmarks :** The pugmarks traced during our thirteen days of observations showed the movements of two leopards in the Maha-Kho valley.

On the 18th morning, we noticed a very large number of leopard pugmarks on the mud road coming from *Kalibhat*. We noticed that

they did not belong to one animal, instead of two – a female with a male in tow.



Tracing the individual

On the 19th morning, on the same path – but the other side, the same pair of pugmarks was seen. In response to the langur alarm calls, we went ahead to investigate further and heard the mating calls below the western ridge.

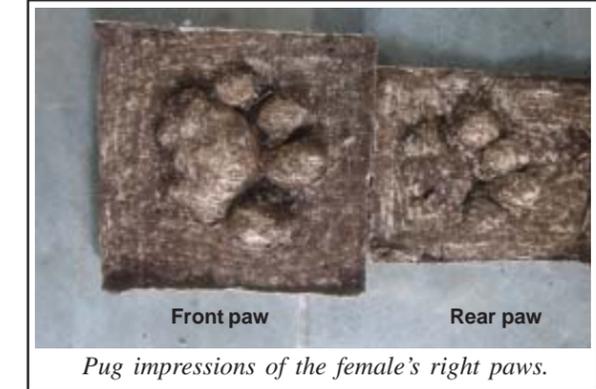
On the 23rd, the female leopard's pugmarks overlapped the tire marks of a Gypsy and a cycle that had passed earlier that morning.



Pug impressions of the male's rear left paw.

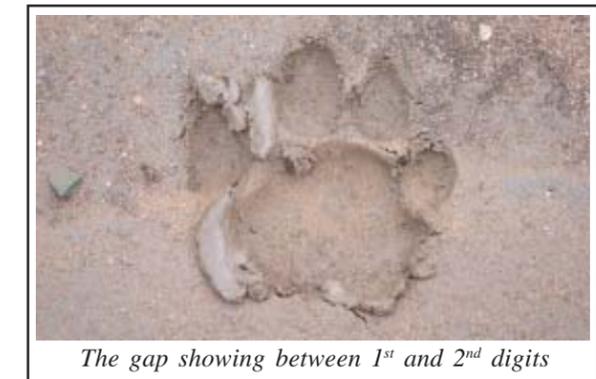
This was the first time that she displayed diurnal activity. On the 27th, she alarmed a group of blue bulls near our chowky at 2:50 pm. We launched a search and very soon traced her pugmarks in the wet soil (post earlier night's rain) near the well – just about 50 mtrs from the chowky.

The male in the meanwhile continued his regular movement in the valley, dotting it with



Pug impressions of the female's right paws.

his distinct but now individual impressions. After the 25th, there was a noticeable change in the markings of the female's pugmarks. The right paw showed a distinct gap between the first and the second digit. She seemed to have injured it, creating an abnormal appearance. This observation continued till the last observations were taken when she



The gap showing between 1st and 2nd digits

made a kill of a cow next to the great banyan tree in the bed of the stream.

On 25th night, one of the two leopards visited our chowky at 8.40 pm – probably attracted by the large amount of cowdung left by a cow in our absence. However, the hard ground did not allow collection of any pugmarks and hence we could not confirm whether the animal was the male or the female.

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

- Taking POP casts: We could prepare a total of 8 POP casts of the slightly deeper pugmarks.



A participant laying the cast

- Photo-documenting all pugmarks: We photographed all the various sets of pugmarks seen during this exercise.

- Scat collection study of remains of bones to observe the feeding habits:

Our scat and bone remains study showed the leopard's primary dependence on cattle and goats for food.

In one case the remains of a female bluebull hair was observed.

One scat showed the presence of crab parts.



Participants studying the scat of a leopard

- We also had the opportunity to study the scat of the rusty spotted cat. The study of this scat showed:

A strong preference for bats that shared the habitat amongst the rocky crags.

An interesting find included a pincer of the camel spider (family salifuse).

- Keeping a note of the leopard's calls and the alarm calls of various animals to note the movement of the leopards: The sawing calls of the leopard were heard on three separate occasions. These were mainly in the early mornings and late evenings. The other major aid in following the leopard movement were the alarm calls. The commonest alarm calls were those of blue bulls, langurs, peafowl, and rhesus macaques. One set of calls by the sambar and barking deer were also



Making of a small waterhole

heard. On one occasion, the calls of blue bulls were heard during mid day.

- Construction of a small waterhole for the animals to drink: In the absence of rains, the only source of water was the small stream at the beginning of the valley, near the *Mahadeo* temple. We constructed a small waterhole next to the well, close to the chowky. A local Pundit from *Hindwad* who regularly bathes in the well has offered to fill up the waterhole everyday. The female leopard already gave the waterhole her approval by a visit during broad daylight.

3. Study of Vulture roosting sites.

On our first walk to get drinking water, we noticed numerous long billed vultures landing on the cliffs of the eastern ridge. We noticed a nesting site along with a large number of roosts. One group of participants was formed to further investigate the roosting habits and we selected the cliffs of the opposite western ridge to reach almost eyelevel with the roosting birds. Over the next many days, we continued our observations.



The ridges provide ample roosting sites

The observations are as follows:

- Mainly the long billed vultures used these sites for roosting. Only one white backed vulture and one king vulture were observed.
- Only 2 nesting sites were found on the whole expanse of the Maha-Kho cliffs. The roosting sites were very large in number. But all of them were never used at any one point of time.
- The roosting sites are not specific to an individual bird – showing no signs of territorial behaviour. They kept pushing out each other and exchanged their roosts till the fall of dusk.
- In the nesting site, the parent birds regularly came to feed and preen the fledgling.

- The number of birds for every evening was never the same – suggesting that they need not necessarily return to the same roosting area every evening.



The king of all he surveys : King vulture

- On an overcast evening, the return to the roost was invariably “pre-poned” to around 4 pm instead of the regular 6 - 6.30 pm. The last return to the roost was recorded at 7.50 pm. - in semi dark conditions.

- As the opposite cliffs are quite close to each other at many locations, vultures many a time, did not have sufficient turning radius to drop height to reach lower roosts. Here, they showed a hawk – falcon like stalling – altitude dropping behaviour to reach the roost or the nest.

- We noticed 3 vultures who had died of natural causes, during our survey. It would be interesting to observe the impact of diclofenac on these birds, owing to the site's close proximity to human habitation.

This is unlike the vultures of the National Park, who depend more on the forest carcasses.



Diclofenac ????

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

4. Study of Watershed and problems of Prosopis

The Maha-Kho Valley presents an excellent watershed with steep cliffs on both sides followed by gentle slopes leading to a central stream. The benefits of this watershed treatment promised good scope for arresting soil erosion and ensuring water percolation. The villages down stream would be the major beneficiaries.



Learning lessons in conservation early - interactions with the DCF.

The old anicut was already serving good purpose in percolating large volumes of water into the aquifer. The newly constructed contour dykes and trenches and the loose boulder structures showed their effectiveness in the downpours during our stay. Insights given by Shri. Shekhawat during his visits proved very useful in understanding of the watershed management. The participation of the village Eco-Development Committee in building these structures was also noted.



Problems of Prosopis juliflora

Around the village of Hindwad, we noticed a large number of Prosopis plants. This is a well known thorny invasive weed, which covers up large areas. This prevents the growth of grasses and local plants. The leaves are not eaten by animals but pods are. Extracting firewood is almost impossible due to the thorns and long thin branches.

The seeds have already reached the Maha-Kho valley through the cattle dung and many plants have caught root. While they are in significant numbers, the situation has not yet reached alarming proportions. It is still

possible at this stage to control the menace of Prosopis by manually removing the existing plants, before they seed and multiply. Or very soon the rich and extensive deciduous forest of Maha-Kho will give way to a useless Prosopis scrub forest.

Note: Depending on the villagers to cut and take the wood for burning is not a solution as they find this plant very difficult to handle and the burning mass is also very small.

5. Birds and Nest study

Maha-Kho valley provided an excellent scope for the birders to make observations. Especially interesting during the onset of monsoons was the nesting related activities of the birds. Birds showed strong preferences for locations, trees and heights from the ground. (A detailed list of birds observed during our stay is mentioned in the observations). Some of the nesting related observations are:

- The white eye nests were just about 3-4 mtrs above the ground
- Probably the most nest related observations were made of the fantail flycatcher
- Most of the hollows in trees were taken over by the brahminy mynas.
- Golden orioles wove up their basket nests.
- Two families of long billed vultures took up the tall cliffs.
- Black drongos permitted us the opportunity to observe all stages of upbringing – with 4 chicks learning to fly and feed on a bare tree next to our chowky.
- Baya weavers found palm trees suitable, but probably did not find them in sufficient numbers. The presence of over 25-30 nests on each tree was a fascinating sight.
- Alpine swifts made a dash to their nest and abruptly slowed down to gently land on their delicate nests amongst the cliffs.
- Spotted doves preferred the acacia trees. The safety of the thorny trees meant that the bird would not fly off till some one actually stood under the tree.
- Large number of immature male paradise flycatchers were seen with different stages of tail growth. The brown coloured males and

females were also seen being fed by their parents.

- Tickell's flycatcher chose a hollow of a tree to raise its clutch.
- Indian pitta parents collected food and chased away marauding rufous tree pies.
- Plum headed parakeets and rose-ringed parakeets babies seemed as noisy as their parents.
- White bellied drongos seemed to be teaching their young the style of imitating calls and almost mewling sounds.
- Redvented bulbuls still seem to amaze us – nesting right in the middle of all the activity.
- Baybacked shrikes and grey shrikes preferred the scrub forest areas for nesting.
- Red wattled lapwings used the large plains above the cliffs and the open land close to the Hindwad village.
- Crested bunting pairs fed chicks near the rocky areas of the stream.
- Eurasian eagle owl: The great banyan tree in the stream had a huge nest that we suspected to be of this wise bird.

Observations of Nest robbing:

- The small Indian mongoose and tree pies were mainly responsible for the nest raiding. The small Indian mongoose was found stealing an egg from the nest of a brahminy myna.
- The rufous tree pie was seen raiding the nests of small birds. On many occasions, it was seen being mobbed by fantail flycatchers, drongos, pitas, orioles and bulbuls.
- Brahminy mynas mobbed a monitor lizard near the well, below the chowky.

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

6. Observations

Mammals observed

1. Stripped Squirrel- *Funambulus palmarum*
2. Rhesus Macaque – *Macaca mulatta*
3. Common Langur- *Semnopithecus entellus*
4. Blue Bull- *Boselaphus tragocamelus*
5. Indian Gazelle- *Gazella bennettii*
6. Sambar- *Cervus unicolor*



Catch me if you can... small Indian fox

7. Rusty Spotted Cat- *Prionailurus rubiginosus*
8. Jungle Cat- *Felis chaus*
9. Palm Civet- *Paradoxurus hermaphroditus*
10. Rufous Backed Hare- *Lepus nigricollis*
11. Ruddy Mongoose- *Herpestes smithii*
12. Common Mongoose- *Herpestes edwardsii*
13. Small Indian Mongoose- *Herpestes javanicus*
14. Indian Pygmy Bat- *Pipistrellus tenuis*
15. Fulvous Fruit Bat- *Rousettus leschenaulti*
16. Wild Boar- (*Sus scrofa*)
17. Indian Fox- *Vulpes bengalensis*
18. Field Mouse- *Mus booduga*

Sightings at Khedi and Kalibhat chowkies.

1. Leopard- *Panthera pardus*
2. Sloth bear- *Melursus ursinus*
3. Porcupine- *Hytrix indica* (scat & pugmarks)
4. Bats (sp. ?)
5. Pangolin- *Manis crassicaudata* (excavation)
6. Small Indian Fox- *Vulpes bengalensis*
7. Jackals- *Canis aureus*
8. Striped Hyena- *Hyaena hyaena* (pugmarks)

Amphibian Survey

The forests of Maha-Koh erupted with amphibian activity after the first major showers, though not all the species have been accounted, the confirmed reports are as follows

- Common Indian Toad (*Bufo melanostictus*) This toad was the most common amphibian in the area, nocturnal activity was observed. Mating was also seen.
- Indian Bull Frog (*Hoplobatrachus tigerinus*) The largest of the Indian Frogs was seen in most of the big waterholes in the plains of Maha-Koh, again nocturnal activity observed.
- Indian Skipper Frog (*Euphylyotis cyanophylctis*) This frog was seen near the barrage, very quick and agile in the water.
- Indian Burrowing Frog (*Tomopterna breviceps*) This frog was seen in the stream near the barrage, extensive croaking was observed, again nocturnal activity seen, the rear foot has a modification which helps the frog burrow.



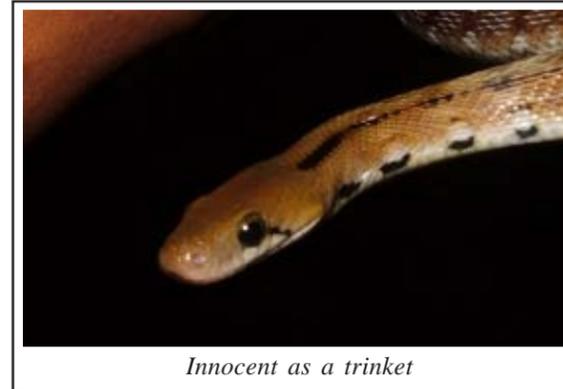
Bloat up ... A marbled balloon frog

- Marbled Balloon Frog (*Uperodon systoma*) This frog was seen on dry land in thick leaf litter, when it was disturbed it bloated up like a perfect balloon, by which it gets its name. Another interesting behaviour we observed was this frog's ability to climb vertical walls which it showed on the terrace of our chowky.

Study of the Reptile Life

A total of 7 species of snakes were recorded from the Maha-Koh valley and adjoining areas.

- Common Vine Snake (*Ahaetulla nasuta*): This snake was seen on a tree next to the Maha-Koh chowky, there are very few records of this snake in Rajasthan. The sighting took place at night and the snake disappeared into the thick foliage.



Innocent as a trinket

- Common Trinket (*Coelognathus helena helena*): Trinket is a very common snake in these parts, it was found on the road near the chowky. The temperament of the snake was very docile and it was handled without any problems.
- Common Krait (*Bungarus caeruleus*): This snake was seen on the main road near Khedi Chowky. Many snakes die on this road, though this one was lucky enough to escape.
- Saw-Scaled Viper (*Echis carinatus*) (Road Kill): Saw scaled vipers are common here as the open rocky habitat suits them the best. Most snake road kills in these parts are of this snake.
- Common Ratsnake (*Ptyas mucosa*): Ratsnakes are common in most farms here. The sighting took place in a farm near Hindhwad.



Amongst the fastest... Indian gazelle

- Common Bronzeback (*Dendralaphis tristis*): This snake was seen behind the Khedi chowky in a *Prosopis* shrub. It was very quick and disappeared almost immediately.
- Checkered Keelback (*Xenochropis piscator*): After the first heavy showers the Barrage near Maha-Koh chowky was overflowing. This increased amphibian activity inviting these water snakes; we found more than 4 snakes in a radius of 10 metres. One of them had probably consumed a frog and was very docile and lethargic. Most of these snakes were full grown adults.

Lizards, Geckos and Skinks

- Common Garden Lizard (*Calotes versicolor*): This lizard is very common here. Many different colour variations were seen. These lizards acted very bold, letting you approach very close.
- House Gecko (*Hemidactylus flaviviridis*): This Gecko was a resident in the chowky feasting on the insects which were attracted by our candles and torches. Nocturnal activity observed.
- Rock Gecko (*Hemidactylus maculates*): This Gecko was found between big boulders and in caves, a very difficult animal to catch as it escaped into the narrow crags between big rocks and boulders. Most of these geckos were seen at dusk.
- Common Skink (*Mabuya carinata*): This skink was very common here, mostly seen on the barrage near Maha-Koh chowky.
- Monitor Lizard (*Varanus bengalensis*): The monitor lizard was seen on a number of occasions near Maha-Koh as well as Khedi. Most were seen when they suddenly moved- disturbed by our presence. Very fast sprinters on dry land. There is a record of a big monitor lizard attacking a young goat in these parts.

Beliefs of Locals:

Most people in the nearby villages showed extreme fear of the monitor lizard locally called as the "Goyra". According to them if a monitor ever bites a person, the victim turns blue and dies immediately. The Locals speak of a snake called the "Kala Nag" which lives for a 100 years. The Locals have no knowledge about anti-venom and the only cure they seek is a local priest who ties a thread near the bite site and cures the victim.

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

Study of Insects, Spiders and Scorpions

The entire Maha-Koh valley has an amazing diversity of these lesser creatures.

- Tiger Centipedes (*Scolopendra polymorpha*) are common and were seen in good numbers on top of the western ridge. The largest specimen we



Polka Dots...Six spotted bug

observed was approximately 15 cms long. Most of these centipedes were found under rocks and tree barks. Sometimes when these centipedes were disturbed they froze and acted dead. These centipedes can inflict painful bites. The Common Centipede was also seen in good numbers.

- A good number of Fat-tailed scorpions (*Mesobuthas tamulus*) were seen, most were found under rocks. Two full grown specimens were seen on trees. A pregnant female was also seen.



A fat tailed scorpion

- Other insect life was also very diverse. Extensive mating of millipedes was observed, there were huge congregations of millipedes seen in many areas. Velvet mites, blister bugs and six spotted bug are common in most parts of the valley, the six spotted bug released some kind of an acid when approached. Camel spiders of the salifuse family were found on the Western Ridges, one specimen instead of fleeing when discovered, stood ground and even attacked when it was touched.

Many more different insects were also seen which are unidentified. Research on insects of the area should be carried out.

Bird Species observed at Ma-Kho

1. Alexandrine Parakeet *Psittacula eupatria*
2. Ashy Crowned Finch-Lark *Eremopterix grisea*
3. Ashy Wren-Warbler *Prinia socialis*
4. Baya *Ploceus philippinus*
5. Baybacked Shrike *Lanius vittatus*
6. Alpine Swift *Tachymarptis melba*
7. Blackcrowned Finch-Lark *Eremopterix nigriceps offinis*
8. Black Drongo *Disrurus adsimilis*
9. Blackwinged Kite *Elanus caeruleus*
10. Blackwinged Stilt *Himantopus himantopus*
11. Plum headed Parakeet *Psittacula cyanocephala*
12. Blue Rock Pigeon *Columba livia*
13. Brahminy Myna *Sturnus pagodarum*
14. Brown Fish Owl *Bubo zeylonensis*
15. Brown Flycatcher *Muscicapa latirostris*
16. Brown Rock Chat *Cercomela fusca*
17. Cattle Egret *Bubulcus ibis*
18. Common Babbler *Turdoides caudatus*
19. Common Hawk-Cuckoo *Cuculus varius*
20. Common Nightjar *Caprimulgus asiaticus*
21. Crested Bunting *Melophus lathamii*
22. Crimsonbreasted Barbet *Megalaima heamacephala*
23. Crow-Pheasant *Centropus sinensis*
24. Cuckoo - Indian *Cuculus micropterus*
25. Dusky Crag-Martin *Hirundo concolor*
26. Black rumped Woodpecker *Dinopium benghalensis*
27. Golden Oriole *Oriolus oriolus*
28. Great Horned Owl *Bubo bubo*
29. Green Pigeon *Treron phoenicoptera*
30. Greyheaded Flycatcher *Culicicapa ceylonensis*
31. Grey Partridge *Francolinus pondicerianus*
32. Grey Shrike *Lanius excubitor*
33. Grey Tit *Parus major*
34. Hoopoe *Upupa epops*
35. House Crow *Corvus splendens*

36. House Sparrow *Passer domesticus*
37. Indian Common Myna *Acridotheres tristis*
38. Hawk Cuckoo *Hierococcyx varius*
39. Indian Robin *Saxicoloides fulicata*
40. Indian Roller *Caracias benghalensis*
41. Indian Wren-Warbler *Prinia subflava*
42. Iora *Aegithina tiphia*
43. Jungle Babbler *Turdoides striatus*
44. Jungle Bush Quail *Perdica asiatica*
45. Jungle Crow *Corvus Macrorhyncos*
46. Jungle Nightjar *Caprimulgus indicus*
47. Kestrel *Falco tinnunculus*
48. King Vulture *Sarcogyps calvus*
49. Koel *Eudynamys scolopcea*
50. Large Cuckoo Shrike *Coracina novaehollandiae*
51. Large Desert Lark *Alaemon alaudipes*
52. Large Grey Babbler *Turdoides malcolmi*
53. Little Brown Dove *Streptopelia senegalensis*
54. Longbilled Vulture *Gyps indicus*
55. Magpie Robin *Copsychus saularis*
56. Paradise Flycatcher *Terpsiphone paradisi*
57. Pariah Kite *Milvus migrans*
58. Peafowl *Pavo cristatus*
59. Pied Crested Cuckoo *Clamator jacobinus*
60. Pied Myna *Sturnus contra*
61. Pitta *Pitta brachyura*
62. Purple Sunbird *Nectarinia asiatica*
63. Redrumped Swallow *Hirundo daurica*
64. Red Spurfowl *Galloperdix spadicea*
65. Redvented Bulbul *Pycnonotus cafer*
66. Red Wattled Lapwing *Vanellus indicus*
67. Ring Dove *Streptopelia decaocto*
68. Rock Bush Quail *Perdica argoondah*
69. Roseringed Parakeet *Psittacula krameri*
70. Rufousbacked Shrike *Lanius schach erythronotus*
71. Shikra *Accipiter badius*
72. Small Green Bee-eater *Merops orientalis*
73. Small Minivet *Pericrocotus cinnamomeus*
74. Spotted Dove *Streptopelia chinensis*
75. Spotted Owlet *Athena brama*

76. Stone Curlew *Burninus oedicnemus*
77. Tailor Bird *Orthotomus sutorius*
78. Tickell's Blue Flycatcher *Muscicapa tickelliae*
79. Tree Pie *Dendrocitta vagabunda*
80. Whitebacked Vulture *Gyps bengalensis*
81. Whitebellied Drongo *Dicrurus caeruleus*
82. Whitebreasted Kingfisher *Halcyon smyrnensis*
83. Whitebrowed Fantail Flycatcher *Rhipidura aureola*
84. White Eye *Zosterops palpebrosa*
85. Yellow Fronted Pied Woodpecker *Dendrocopus mahrattensis*
86. Yellow Throated Sparrow *Petronia xathocollis*



Waiting for the rains... pied crested cuckoo

87. White naped woodpecker *Chrysocolaptes festivus*
88. Eurasian Cuckoo *Cuculus canorus*
89. House Swift *Apus affinis*
90. Sykes Nightjar *Caprimulgus mahrattensis*
91. Crested Honey buzzard *Pernis ptilorhynchus*
92. Little Egret *Egretta garzetta*
93. Pond Heron *Ardeola grayii*
94. Black Headed Cuckoo Shrike *Coracina melanoptera*
95. Jungle Myna *Acridotheres fuscus*
96. Jungle Wren Warbler *Prinia sylvatica*
97. Brown Rock Chat *Cercomela fusca*
98. Mottled Wood Owl *Strix Ocellata*
99. Rufous Tailed Lark *Ammomanes phoenicurus*
100. Grey Hornbill *Ocyeros birostus*

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

Trees of Maha- Kho

1. Banyan	Ficus benghalensis
2. Tendu	Diospyros malanoxylon
3. Salar	Boswellia serrata
4. ROUNG	Acacia leucophloea
5. Babul	Acacia nilotica
6. Kumtha	Acacia Senegal
7. Bael patra	Aegle marmelos
8. Kala siris	Albezia odoratissima
9. Dhok	Anogeissus pendula
10. Neem	Azadirachta indica
11. Hingota	Balanites aegyptiaca
12. Kair	Capparis deciduas
13. Amaltas	Cassia fistula
14. Lisorha	Cordia dichotoma
15. Sisham	Dalbargia sisoo
16. Goolar	Ficus racemosa
17. Jamun	Syzgium cumini
18. Imlee	Tamarindus indica
19. Kuda	Wrightia tomentosa
20. Kala Kuda	Wrightia tinctoria
21. Peepul	Ficus religiosa
22. Khajur	Phoenix sylvestris
23. Dhak	Butea monosperma
24. Ghost tree	Sterculia urens
25. Khair	Acacia catechu
26. Prosopis	Prosopis juliflora

- Anogeissus (Dhok) was the most prominent tree here.
- The Sterculia (Ghost tree) and Boswellia (Salar) are sentinel trees - growing typically on the ridges.
- Syzgium (Jamun) was found growing mainly in the streambed.
- Diospyros (Tendu) was quite common and found growing on the banks of the stream.
- Some of the largest trees in the valley were Ficus (Banyan). Most of them were multi stem trees.
- Acacia (Roung) was the commonest of acacias.
- There was a significant growth of Prosopis Juliflora. This is an invasive weed and needs to be removed manually.

Report from Khedi Chowky

The two valleys behind Khedi chowky were studied. The Vegetation in these valleys is denser on the slopes compared to the foothills and the plains, the reason could be extensive cattle grazing. There is mostly thorny and scrub vegetation in the plains hence a lot of nilgai (*Boselaphus tragocamelus*) activity takes place here, two herds of nilgai were observed.

There is a considerable population of the Indian hare (*Lepus nigricollis*) many sightings took place. On one trail 12 individuals were seen. This suggests that there is a very healthy preybase for lesser animals. The common mongoose (*Herpestes edwardsii*) was seen a number of times in the plains, the small Indian fox (*Vulpes bengalensis*) was seen early in the morning near the chowky. Jackals (*Canis aureus*) were also seen, on one occasion a pack of 4 was seen outside the boundary wall. Striped hyena (*Hyaena hyaena*) footprints were seen only in the plains which continued for long distances. Hoofmarks of chinkara (*Gazella bennettii*) and wild boar (*Sus scrofa*) were seen on the hilltops. Two groups of common langurs were seen on the cliffs in the valley, none of these groups were seen in the plains or the foothills.

A leopard sighting took place behind the Khedi chowky near the saucer. The leopard was sitting in the undergrowth when it was disturbed by our presence, after seeing us she quickly got up and moved towards the hill, we tried to follow but were warned by a growl.

BIRDLIFE: Mostly birds of scrub vegetation were observed - grey partridges and rock bush quails were seen frequently. We found the presence of 3 species of shrikes - the grey shrike, rufous backed shrike and the bay backed shrike. Nesting of grey shrikes was observed. Raiding of the nest by tree-pies was observed, on one occasion a tree-pie managed to get hold of a chick, but was mobbed by the parents and the chick was dropped on the ground. Ashy crowned finch larks are also very common in this area. Many flocks of Indian silverbills were seen. Nesting of red-rumped swallows was seen in the concrete pipes made near the village. Five long billed vultures were seen roosting in the cliffs in the eastern valley, one white backed vulture was also seen but was not observed roosting.

Socio- Economic Study Whose forest is it anyway?

7. Man - animal conflict, “their” forests & conservation

As Human populations expand and our forest cover shrinks, people and animals are increasingly coming into conflict over living spaces and food. People suffer major losses as their crops are destroyed, livestock predated and sometimes they themselves are attacked and killed. The animals which are already threatened or endangered are often killed in retaliation. Man-animal Conflict is one of the major threats to the survival of many species in many parts of the World.

After a study of the human interaction with the forest in the Sawai-Mansingh Wildlife Sanctuary in the villages of Khedi, Hindhwad and Kalibhat; some issues resulting in the direct conflict have been narrowed down on.

- Destruction of Crops: Most of the population in these villages is engaged in farming. These farms are located very close to the forest and hence attract the great Indian antelope also known as the nilgai (*Boselaphus tragocamelus*) and the wild boar (*Sus Scrofa*) in great numbers. These animals raid the farms after dusk and consume most crops on a large scale. When driven off they damage more crops and end up damaging more than consuming. The name “Nilgai” suggest cow and villagers tolerate them unless losses are unbearable. At night, the farmers sit up in Machans constructed by them in the middle of a farm flashing torches and shouting loudly to scare away these animals. The wild boar is an even greater

menace than the nilgai. It digs out the newly sown seeds and grains and damages most of the crops too. Occasionally wild boars are shot and crude bombs are mined in the farms, meat of the wild-boars is often consumed.

Overall a farmer suffers major losses due to this. The suggested solution to build a fence around their respective farms to keep out animals is extremely expensive.

- Livestock Predation: Despite the prohibition, villagers simply let loose the cattle and goats inside the forest to graze.

Grazing zones have been made by the Forest Department but are not respected by the villagers.

- Cows immediately fall prey to the very opportunistic leopard (*Panthera pardus*) who

thrives here with plenty of domestic prey around. Goats easily fall prey to small carnivores like the jackal (*Canis aures*), Indian fox (*Vulpes bengalensis*) and the hyena (*Hyaena hyaena*). Lifting of livestock from the stables inside villages happens frequently, mainly goats are lifted. Multiple animals are killed occasionally; there is also a report of a total of 8 animals killed in one attack by a leopard.

- When a big cattle is killed, the villagers occasionally poison the carcass. This practice although a crime is practiced frequently. If cattle is killed in the forest NO COMPENSATION is provided, but if an animal is killed inside the village Compensation is given by the government.



Waiting for a night time raid on a farm : Bluebull

However, as most attacks happen inside the forest during illegal grazing, the villagers suffer great losses bringing them into direct conflict.

- Attacks on Man: People frequent the forest for resources like firewood and minor produce. Many people also enter the forest to defecate. Sometimes animals like the Leopard and the Sloth Bear are surprised by sudden human presence which triggers an attack in self

defense. Leopard attacks are rare but cases of mauling have been recorded. A few years ago, a leopard had become an infamous child-lifter. No such cases have been reported ever since. Attacks by sloth bear are more frequent. Often when humans stumble upon tigers or leopards the big cats run away but a startled bear will launch a vicious attack. One such attack took place during our stay.

- Sloth Bears have very poor eyesight and hearing; they tend to walk looking downwards foraging for insects and termites and hence sometimes stumble into people. The Claws (8-10 cms long) of the sloth bear are deadly weapons which inflict irreparable damage; this combined with a body weight of 80 to 140 kgs makes a sloth bear a very dangerous animal to disturb. Most people are attacked when they stumble into a sleeping

bear in the morning, while out defecating or collecting firewood in the forest. Sloth Bear attacks frequently result in death.

- Man-Animal Conflict contributes to all the other major problems in the Sawai-Mansingh Wildlife Sanctuary.

Education about the animals and their behaviour should be communicated to the villagers to minimize the damage. A Fence around the farms is a good solution to keep out nilgai and wild boar. Allowing cattle to graze inside the

forest will always result in them being killed, thus grazing sites should be changed or Stall Feeding should be undertaken.

“THEIR” FOREST

While we were in the Sawai Mansingh Wildlife Sanctuary, interaction with locals and the forest department led us to believe that

there was neither sufficient communication between the two, nor enough involvement of the community in forest management activities. This is despite the fact that the local community’s lifestyle relies heavily on the forest. The

following report tries to analyze one of the many factors contributing to this state of affairs.

Whose forest?

Undoubtedly the biggest problem faced by the forest department in the conservation of



Grazing cattle inside the forest



Will someone listen to us?

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

Ranthambhore Tiger Reserve is the total lack of co-operation from local villagers. It is evident that the villagers feel very little responsibility towards conservation of the forest - that when they are entirely dependent on the forest for life itself.

Both the villagers and the forest department are responsible for this state of affairs. The end result is that villagers feel absolutely no attachment for the forest. The forest, its management, its conservation, and associated issues are all headaches of the forest department alone.

Timeline

Putting together pieces from our conversations with villagers as well as forest officials, and working backwards, I visualize a sequence of events something like this:

Centuries ago, there was perfect harmony. Villagers made judicious use of forest resources. And they thought, "This is our forest". During the Raj period, forests became "Centralised" - the property of the government and were exploited to meet the demands of the industrial revolution in Europe. There was poor management of forests, in the sense that large-scale, possibly irreversible steps were taken without understanding the forest ecology, for example:

- Introduction of exotic timber species to replace the natural forests - without understanding their impact on the ecosystem.

- Artificial plantation for "greenification"

However, the impact of these actions would very probably have been absorbed by nature over time. And, most importantly, the villagers still thought, "This is our forest".

Forest Dependence

Staying in close proximity to the forest, implies that major demands in the day to day life are met from the forest.

Direct - Grazing land for the cattle, fuel wood for cooking, wood for building homes and thatching needs and stone for building. Sometimes even bush meat like partridges, hare and occasionally deer.

Indirect - Water resource, cooling of the climate and basic balance of the Ecology.

Minor Forest Produce : Khus Khus, Gum, Cheela leaves for making cups and saucers, date palm leaves for making fans or brooms, honey, medicines and some fruits. But most of these are for personal use rather than commercial produce.

There have been several ambitious projects of providing LPG gas and other alternative fuel means but none of them have been very successful.

The answer lies in finding an indigenous fuel like Biogas.

Unfortunately the cattle graze too far and wide to be able to collect the fuel. Stall feeding will have to be started before projects like that can be initiated.

Impact of grazing cattle

The cattle and goats put tremendous pressures on forests. These domestic animals in the first place compete with the forest ungulates for food and water, but more importantly are the source of diseases not naturally known to the forest residents. The cattle dung also gets into the forest, seeds of exotic invasive weeds like the Prosopis- as they come to the forest from the villages. This dung, which should have been typically been collected as a fuel or manure, instead decomposes in the forest.

The worst impact of grazing is on the regenerating stumps that are grazed and not naturally allowed to regrow into trees. The absence of the young trees, required to replace the mature trees, is a very scary picture indeed.

About a century ago, another factor came into play. The population explosion obviously put a strain on resources. The resulting shortage led to greed and materialism, which

further compounded the problem. Villagers began to exploit resources rather unwisely. In 1955, the region was declared as Sawai Madhopur Wildlife Sanctuary. The immediate results were excellent. By 1970, hunting was more or less brought to an end. The villagers were told, "Don't touch the forest". While this cut interference, the villagers, over time, began thinking, 'It's not our forest anymore. It's "their" forest now'.

So from not-so-long-ago, when villagers were deeply attached to a forest emotionally, gradually, they started to lose that attachment. Today, they are moving towards harboring a hatred for the forest.

The situation today

The needs of villagers haven't changed. The 200 000 - odd villagers of the 96 villages surrounding the Ranthambhore Tiger Reserve still need firewood to cook their food, stone to build their homes, and plants to graze their cattle. Their only source for all these essentials is the forest. They continue to exploit the forest for these purposes, even though the rules prohibit them from doing so. After all, alternatives are either unavailable or hugely expensive and impractical for an average poor villager.

At the same time, their mentality is now a "their" forest mentality. So they conveniently shun their responsibility towards conservation. Thus excessive grazing, tree felling and illegal collection of forest produce continue, but the general attitude towards the forest and forest department is one of resentment and antagonism.

This is made worse by certain policies. For example, when cattle graze in the forest, the animals are confiscated and villagers are fined Rs. 100 per animal. So far, so good. However, if a leopard kills a goat inside a village, the villagers have to go through the

lengthy procedure of filing a claim, after which they get only Rs. 100, for an animal that costs, according to them, around Rs. 2000. (Mr. Mahavir Sharma, the forester at Kalibhat, mentioned that the compensation amount had been increased recently, but didn't specify the exact amount.) Also, if wild animals such as nilgai or wild boar destroy crops of villagers, they get little compensation. This inadequate compensation, in the minds of the villagers, reflects a lack of consideration and empathy for them on the part of the forest department. And since it is the wild animals that are ultimately responsible for their losses, the villagers develop a further antagonism towards the forest.

Mindset moving one step further towards: "Down with the forest!"

The Root of the Problem (and the obvious idea for uprooting it) The problem, as we see it, is that the old British attitude of completely separating the common villager from management of the forest still persists.

Summing it up

Villagers need the forest. Yet, because of socio-economic circumstances and conflicts with the forest department, they have, to a large extent, disowned responsibility for it, and therefore exploit it in an unsustainable manner. While strict enforcement of rules can help to a certain extent, it will inevitably lead to friction with locals, and thus compound management headaches in the future.

Conservation efforts can only be sustained in the long run if we give the villagers a stake in the forest, and, more importantly, convince them how big the stake is. We have to make them want to save the forest. We have to bring the attachment back. We have to make them think, 'This is "our" forest. And no one will harm it'

PUGMARKS

Discover your planet.
Discover Yourself

PUGMARKS

Discover your planet.
Discover Yourself

8. Understanding the local economy around Ma-Kho

Area Background— Maha-Kho Chowky is situated inside the Sawai Mansingh Wildlife Sanctuary, south of Ranthambore National Park. It is approximately 3.5 km from the village of Hindwad, and about 15 km from Sawai Madhopur by road.

The local economy is basically centered on subsistence farming and animal husbandry. Farmers hold multiple patches of land, more often than not small and scattered, and totalling up to between 2-8 bighas (1 bigha = 160 ft x 160 ft) for the average farmer. Very few landowners own more than 10 bighas of land, which may be considered as a sort of threshold for a farmer to go beyond mere subsistence farming. Most farmers maintain a few head of cattle or some goats to provide extra income. Herders typically rear goats. Not many sheep are seen in this region, we encountered only one shepherd during the entire stay at Maha-Kho.

The major castes here are the Meenas (a farming community) and the Gujjars (herdsmen). The area has 2 major political parties – the Congress and the BJP. There are a few other political outfits active here, but they are small, localized, and do not have a significant impact on the local political scenario.

Sample village land-use and livestock figures:

(Figures were obtained for a typical village from the region. These may not be considered as representative of the entire region, but they may be considered to be roughly so.)

Village name – Hajam Khedi.

Population—

1. Total population – approximately 400.
2. Number of children—102.

(Number of children in local school—47)

Land Distribution:

1. For agriculture/related activities – 1150 bg.
Cropped land – 800 bighas.
Pasture land – 300-350 bighas.

(Note – Despite the average per family holding being almost 10.5 bighas at first glance, one family alone owns 85 bighas of land. Adjustments to be made accordingly.)

Livestock:

1. Goats – 100-150
2. Buffaloes – 200
3. Cows – 50.

Tractors:

There are 8 tractors in Hajam Khedi village. Given that only one family owns more than 80 bighas of land here, and the fragmented nature of land-holding, mechanization is not a very viable prospect for local agriculture. The tractors, for most part, are rented out to farmers. This method is locally preferred to actually owning a tractor, or a pair of bullocks. I personally saw few good quality bullocks in the area.

Local agriculture:

Major crops grown here & yields per bigha:

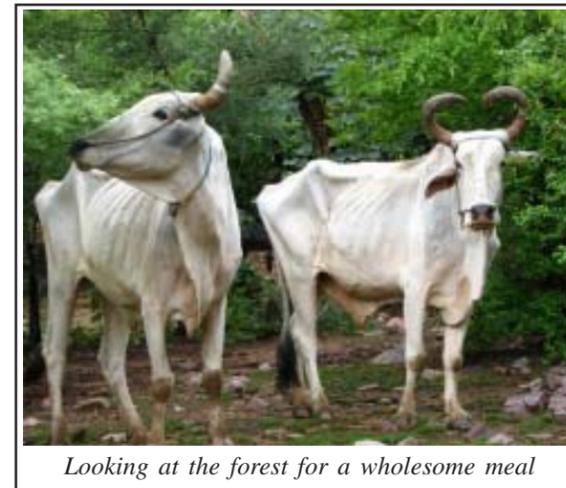
- | | |
|------------|-------------------|
| 1. Jowar | : 10-12 quintals. |
| 2. Bajra | : 6-10 quintals. |
| 3. Peanut | : 5-6 quintals. |
| 4. Mustard | : 2-4 quintals. |
| 5. Wheat | : 9-11 quintals. |

Wheat and mustard are rabi crops, the others kharif. With mustard, only one crop is possible per year. The rest are used in different combination to yield two crops per year. Irrigation is rainwater-dependent in monsoon, and ground-water dependent in winter. Average per bigha yields are seen to be steadily declining over time. Farmers here claim that about a quarter of their output is lost to incursions by nilgai and wild boar.

Fertiliser usage is also seen to be increasing. At current levels, usage per bigha is –

1. Urea – 100 kg per bigha.
2. DAP – 50 kg per bigha.
3. Superphosphate is not very widely used. If used, around 50 kg is used per bigha.

Livestock dung is used as organic manure. There is a significant lack of awareness about techniques such as vermiculture.



Looking at the forest for a wholesome meal

Most of the farmers store a large part of their harvest, selling the surplus after their needs have been met. The produce is sold at Sawai Madhopur. Prices for the last harvest stood at (per quintal) –

- | | |
|---------------------|-------------------------|
| 1. Wheat – Rs. 800. | 2. Bajra – Rs. 400. |
| 3. Jowar – Rs. 350. | 4. Mustard – Rs. 1,600. |

Credit availability.

There is a branch of the Bank of Baroda in nearby Falaudi. Credit availability is not a problem. Dependence on private moneylenders is said to be low, but farmers didn't seem to be very keen to talk about them. Most farmers here have a Kisan Credit Card. Farmer-specific loans are available at

interest rates as low as 1%. The most commonly used collateral for loans is land.

Livestock – The locals here mainly rear cows, buffaloes, and goats. The cattle here are of rather poor quality and do not give good milk yield. This may be attributed to the fact that cows are considered to be a status symbol, and the number of cows owned signifies power and wealth. Hence, cows are indiscriminately bought, even if of poor quality. Most cattle are let loose in the forest to graze. Occasionally they fall prey to leopards and other predators. No compensation is provided if an animal is killed inside park boundaries. If a kill is made outside it, however, the Forest Dept. provides Rs. 100 per goat and Rs. 5,000 per buffalo.

Comments: As can be clearly interpreted, cultivation here is not quite sustainable. This can be further proven by declining yields and increasing fertilizer use. Indiscriminate use of groundwater is leading to depletion of groundwater levels, and loss of forest land further reduces natural water-table recharging. This directly increases the dependence of villagers on the forest, beyond the usual needs for firewood and cattle-grazing. The poor quality of cattle here has already been noted, and these form an unnecessary burden, which villagers are quite content to leave to the forest. The conflict is further stepped up when cattle are lost to leopards or other predators. It is suggested that higher yielding cattle be used in an effort to reduce the unnecessary population. Stall-feeding will also improve yields while reducing the pressure on the forest. Rajasthan has the country's largest population of cattle, and this puts immense pressure on the forests of the state, as we clearly saw at Sawai Mansingh. Sustainable practices are urgently needed for the region if forest lands are to be preserved for the foreseeable future.