

birds were female and on the other there was one male and one female. Considering the latest sighting of GIB at two different sites on the same day, we could conclude that the population may comprise of only seven individuals. The list of villages included in the study is also given below.

Table 1: List of villages with sightings of GIB

No.	Name of Village	Date of Sighting	Age	No. of GIB	Habitat used
1	Shokaliya				
2	Madhopura				
3	Baheda	11/12/2009	Adult	5 (5F)	Agriculture fallow
4	Kesarpura				
5	Kalyanipura				
6	Ramsar	5/3/2010	Adult	5 (1M & 4F)	Agriculture fallow
7	Sanod	3/11/2009	Adult	2 (2F)	Grassland
8	Lorwada				
9	Bhatiyani	15/3/2010	Adult	5 (1M & 4F)	Agriculture fallow
10	Kumhariya				
11	Kebaniya				
12	Ratanpura				
13	Rampura	15/3/2010	Adult	2 (1M & 1 F)	Agriculture fallow
14	Piproli				
15	Bhagatpura				

Assessment of reasons for decline in population of GIB

When we discussed GIB conservation with the villagers, the major problem causing the decrease in population was lack of water. According to the village communities, rainfall patterns have changed and become very irregular and low in past few years (rainfall data for the area are being collected from the nearest weather station). This irregular rainfall has led to the decrease in the area under cropping land as well as a change in the cropping patterns where crops preferred by GIB have been replaced. Apart from the grassland GIB prefer to be in the cultivated fields of groundnut (*Arachis hypogaeae*) and gram (*Cicer arientinum*), which form the main part of their diet after the harvest. With a decrease in rainfall, villagers have shifted to other crops and other hybrid varieties such as mung (*Vigna radiata*) and Jowar (*Sorghum bicolor*) that use less water.

The other reasons cited for a decline in the numbers of GIB in order of priority were:

- *Change in the method used for ploughing*
In previous times manual ploughing using bullocks was done and the nests and eggs were spotted and avoided, thus securing them from any sort of disturbance or damage. Nowadays tractors are used and nests and eggs are destroyed.
- *Lack of availability of water*
The birds need to drink water every day but due to irregular rainfall and lack of any other source of water the birds are stressed for water.

- *Reduced grass growth*
Grass growth has reduced due to the loss of top soil and hardening does not allow the grass to grow, thus resulting in less or thin grass cover, which too is overgrazed.
- *Encroachment of grasslands*
Encroaching of grasslands and other common lands (often and almost always wrongly dubbed as wastelands) by villagers for agriculture has led to loss of nesting habitat. What remain is generally highly degraded and with very thin ground cover and unsuitable for the GIB.
- *Invasion of exotic species*
The decline in animal husbandry due to lack of water has also led to a decline in the quality of the common lands (grasslands and other common lands) as locals do not see value in managing the grasslands and curbing the spread of exotics. However, people spoken to also expressed a need to restore the health of their grasslands.
- *Mining activities*
The conversion of large areas of commons and even some agricultural lands into mining areas has reduced available habitat and also its quality. Blasting in the mines is also said to disturb the birds.
- *Pesticide application*
Use of pesticides, though very low, was expressed as a problem by several people.

Habitat Assessment

Group discussions as well as some qualitative assessments were undertaken in some of the villages as shown below.

Table 2: Response of five villages based on group discussion at Sokaliya GIB Study Area

Regarding	Sokaliya	Sokli	Madhavpur	Kalyanipura	Beheda
Restoration / development of grazing lands	Yes	Not Known	Yes	Yes	Yes
Extent of grazing land	75–90 ha	65 ha (40 ha Tree Growers Cooperative Society)	50- 65 ha	25 –30 ha	200 –250 ha (6.3 ha soil and water conservation work)
Species of grass present earlier	Heran (<i>Themeda triandra</i>), Dhaman (<i>Cenchrus setigerus</i>)	Heran, Dhaman,	Heran, Dhaman,	Heran, Dhaman,	Heran, Dhaman, Bhekrio, Bopara

Whether any systems to manage were followed	No	No	No	No	No
No. of Livestock	450 –500 cattle and buffalo	Not available	Not available	800 sheep and goats	Not available

Methods used

Two step method (c. 75 m) and belt transect (75 x 5 m belt transect) method were used to assess tree, grass and herb species, ground cover and dung and pellet in the study area.

Grass cover in the grazing lands

The number of transects varied according to the extent of the grazing lands, with five such transects in Sokaliya, five in Madhavpura, 12 in Bheda and 10 in Bhagatpur. Based on this it was found that the grass cover was greatest in Sokaliya (79%), followed by Bhagatpura (77%) and Beheda (71%). The lowest cover of 36% was recorded in Madhopura. Madhopura had more barren areas (64%) compared to the other three grazing lands.

One important aspect to be noted is that though the grass cover was more than 70 % in the three grazing lands, it was predominantly represented by *Aristida adscensionis*, a very and thin perennial grass species and less preferred fodder species. The barrenness and poor quality based on both availability of less preferred and low or no nutritive grass species in the grazing lands clearly demands for restoration and development, this coincides with what villages have expressed on their grazing lands during the discussion.

Table 3: Village wise Grass Cover in the Grazing Lands

No.	Cover	Sokaliya	Madhopura	Beheda	Bhagatpura
1	Grass (%)	79.4	36	71	77.4
2	Barren land (%)	20.6	64	29	22.6

Shrub and tree densities in the grazing lands

In total, 8 species of plants that included 1 under shrub, 3 shrub and 4 tree species were found in these grasslands. Of all these *Balanites aegyptiaca* had the maximum densities in three grazing lands except Beheda.

Among the grasslands that were assessed, Sokaliya recorded 7 species, of which 1 was under shrub, 3 were shrubs and 3 tree species. In this grazing land the density of shrubs was more compared to tree and the under shrub. On the whole the densities of shrubs and trees were more in this grazing land compared to the other three grazing lands.

In Madhopura grazing land, only 3 species were noted of which 2 were tree species and 1 shrub species that were found in very high density compared to the 2 tree species.

The grazing lands of Beheda had 6 species of which 2 were shrubs and 4 were tree species. In this area, all the species present were found in low densities, with *Prosopis cineraria*, a tree species, recording the highest density (36/ha) among them.

The densities of shrub and tree were low in Bhagatpura considering the large extent of area it is spread. In this grassland, 6 species were recorded of which 2 were shrubs and 4 were trees. *Balanites aegyptiaca*, a shrub species, was found in comparatively higher densities than the other species.

Table 4: Grazing land wise Density of Shrubs and Trees

No.	Species name	Habit	Density in ha			
			Sokaliya	Madhavpura	Beheda	Bhagatpura
1	<i>Acacia leucophloea</i> (Roxb.) Willd.	T	7.61	0.00	4.44	10.66
2	<i>Balanites aegyptiaca</i> (L.) Del.	S	895.23	3648	2.22	128.00
3	<i>Capparis deciduas</i> (Forsk.) Edgew.	T	34.28	16.00	17.77	42.66
4	<i>Fagonia schweinfurthii</i> (Hadidi) Hadidi	US	11.42	0.00	0.00	0.00
5	<i>Leptadenia phytotechnica</i> (Forsk.) Decne.	S	30.47	0.00	6.66	0.00
6	<i>Prosopis cineraria</i> (L.) Druce	T	0.00	0.00	35.55	16.00
7	<i>Prosopis juliflora</i> (Swartz) DC.	T	26.66	0.00	4.44	32.00
8	<i>Ziziphus nummularia</i> (Burm. f.) Wight & Arn.	S	87.61	170.66	0.00	26.66

Dung and pellet count

The number of pellets and dung were counted mainly to assess the present state of grazing. This revealed that smaller livestock was comparatively more abundant in all the grazing lands than the large sized livestock. Among the four grazing lands that were assessed Beheda was faced with more grazing compared to Bhagatpura (68 pellets and 30 dungs), Sokaliya (48 pellets and 18 dungs), and Madhavpura (25 pellets and eight dungs). However, considering the larger size of the Beheda and Bhagatpura grazing lands the grazing pressure is comparatively less than in the smaller Sokaliya and Madhavpura grazing lands.

Table 5: Number of livestock dung and pellets recorded in different grazing lands

Evidence	Sokaliya - 7	Mathavpura - 5	Beheda – 12	Bhagatpura - 10
Sheep and goat pellets	48	25	145	68
Cattle and buffalo dung	18	8	45	30
Camel pellets	4	0	0	0

Restoring the GIB population and its habitat

It would seem that to arrest the decline in the GIB population and restore its habitat one would have to work on increasing the availability of water in the area. Increased availability of water through well planned and sustainable water-harvesting strategies is likely to revive animal husbandry which in turn would mean an increased interest in restoration and better management of grasslands and other common lands. More water is also likely to once again interest local farmers in reverting to crops such as groundnut and gram.

This done, issues of grassland and common land restoration would have be addressed. For grassland restoration, the shrubs and trees that were found in high densities need to be uprooted and space created for better variety of grasses to grow. While *P. juliflora* is the main fuel wood for most of the villages, it is possible that with better animal husbandry alternative fuel sources such as biogas may be accepted. The increased water availability and restored grasslands and commons are in our understanding not only vital to reviving local livelihoods but critical to reviving the GIB population as well.

In the coming months detailed discussions with villagers of all the 15 villages within the study area would be taken up along with awareness creation and education, in addition to continuing the population surveys and identify the breeding mosaics if at all the GIB still breeds in the area.

