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Flock Size and Flock Composition of House Sparrow, *Passer Domesticus* (Linnaeus, 1758) in Tehsil Pehowa of District Kurukshetra, Haryana, India

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Abstract – Proposed study was carried out in tehsil Pehowa of district Kurukshetra from January, 2010 to December, 2012. In tehsil Pehowa, five rural open areas/rural residential premises, namely, Gauchard (PVI), Dhanipura (PV2), Bhatta majra (PV3), Nipura (PV4) and Khadaspur (PV5); five ware houses/rice sellers/godowns, namely, HAFED1 (PG1), HAFED2 (PG2), Satara rice seed store godowns (PG3), Seth tara chand seed store (PG4) and Govt. ware house, Pehowa (PG5) were selected. Besides these, five number of transects (T1, T2, T3, T4 and T5) in agricultural lands and two areas of fallow lands (FL1 and FL2) were selected in tehsil Pehowa. Scan sampling method (Altman, 1974) was used in the proposed rural open areas/rural residential premises, ware houses/rice shellers/godowns, fallow lands, and line transect method (Sale and Berkmuller, 1988) was used in agricultural areas to record the flock size and flock composition of house sparrow. Each type of flock/individuals are age-sex wise classify and later categorized into four types i.e., all male flocks (AMF), all female flocks (AFF), mixed male-female flocks (MMF) and male-female with youngones flock (MFY) following Robinson et al., 2005. In the present study, a total numbers of 110 flocks of house sparrow, i.e., 55 flocks (in the year 2010) and 55 flocks (in the year 2011) were recorded in selected rural open areas/rural residential premises. Out of these 110 flocks, 11 all male flocks (AMF), 34 all-female flocks (AFF), 62 mixed male-female flocks (MMF) and 2 male-female with youngones flocks (MFY) were observed. Total numbers of 22 flocks, i.e., 12 flocks in year 2010 while 10 blocks in year 2011 were recorded in selected ware houses/rice shellers/godowns. Out of these 22 flocks, 1 all male flock (AMF), 6 all-female flocks (AFF) and 15 mixed male-female flocks (MMF). Similarly in selected agricultural areas, 8 flocks of house sparrow i.e., 5 flocks in the year 2010 and 3 flocks in the year 2011 were recorded.

Keywords: Flock Size and Composition, House Sparrow, Rural Area, Agricultural Areas

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INTRODUCTION

The house sparrow, *Passer domesticus* has a historical commensal relationship with man and has followed his colonization of the majority on the earth and it has become one of the most widely distributed land birds in the world (excluding the Poles) (Summers-Smith, 1988; Gulati, 2005; Anderson and Ted, 2006). The house sparrow originated in the middle East and spread along with agriculture to most of Eurasia and parts of North America and finally all of the world (Anderson and Ted, 2006). It was introduced into South Africa, South America, Australia, Newzealand and America. Its introduction into North America occurred in 1851, when a group of 100 birds from England was released in Brooklyn, New York (Barker, 1935; Champlan, 1966; Sprout, 1970; Crick *et al.,* 2002; Prowse, 2002). House sparrow has worldwide distribution and lives in all continents and many of oceanic islands (Cramp *et al.,* 1985). It is only absent from areas such as China, Indochina, Japan and areas of Siberia and Australia to the East and tropical Africa and northern areas of South America to the West (Summers-Smith, 1988). Two subgroups are currently recognized, *viz.,* the *domesticus* subgroup which contains five subspecies with a natural range covering Siberia, Europe, North Africa, middle East and the subgroup *indicus* containing six subspecies confined to Asia (Summers-Smith, 1988; Barrows, 1984; Entzoe *et al.,* 2003).

House sparrow occurs naturally in most of the Asia and Europe and is also considered to be a relative of the weaver finch family by some researchers. It has also followed humans the entire world and has been introduced in most of the America, some part of Africa, Newzealand and Australia (Anderson and Ted, 2006). The ancient

Romans introduced the house sparrow from North Africa to Europe, Eurasia, America, sub- Saharan Africa, Newzealand and Australia (Gowaty, 1984; Gulaty, 2005). In Asia, house sparrow is mainly distributed in the Eastern China, Bhutan, much of India, Nepal and Pakistan (Claton *et al*., 1992; Baker, 1995; Chapman, 1999; Forbush, 2002; lmhof, 2007; Lowery, 2009; Sprunt and Chamberlain, 2010; "*Passer domesticus*", Animal Diversity Web, 2012).

Generally, house sparrow, *Passer domesticus* is found throughout India, however it is rich in the states of Jammu and Kashmir, Himachal Pradesh, Punjab, Haryana, Rajasthan, Gujarat, Maharashtra, Orissa and Kerala (Claton *et al*., 1992; Anon, 1992; Rajshekhera and Venkatesha, 2008; Bhattacharya *et al.,* 2008; Deniels, 2008; Joshi, 2009; Khera *et al.,* 2010). Three species of house sparrow, namely, *Passer domesticus indicus*, *Passer domesticus parkini* and *Passer domesticus bacterians* were recorded in Indian territories (Krys *et al.,* 2000). Of these, *Passer domesticus indicus* is found all over India and has been introduced in Andaman island, *Passer domesticus parkini* is common resident of Himalayas from Balistan, Kashmir and Laddakh, East of Sikkim (up to 2000m to 4500m) and the *Passer domesticus bacterians* is recorded in small numbers from Rajasthan (Richard *et al.,* 1998; Krys *et al.,* 2000; Grewal, 2002). In Haryana, the house sparrow is highly prevalent in South-West (nearby Rajasthan) as compared to North-East region of state (Sharma, 2009).

MATERIALS AND METHODS:

Study area:

The present study was carried out in the district Kurukshetra, Haryana (India). The district Kurukshetra, also popularly known as ˝Rice bowl of India˜, has an area of 1530 Km^2 constituting 3.8% of the total area of the state of Haryana. It is located between 29°52´ N to 30°12´ N latitude and 76°26´ E to 77°04´ E longitude in the North-Eastern part of the state of Haryana state (Fig. 1). Saraswati, Markanda and Ghaggar are the main rivers of this region. It is surrounded by the districts of Yamuna Nagar in East, Karnal in the South, Kaithal in the South-West and Ambala in the North-West side. It has four tehsils, namely, Pehowa, Thanesar, Shahabad and Ladwa with 419 villages and is one of the agriculturally prosperous districts of the state with wheat, rice and sugarcane being the main crops. The industrial sector of the district is also greatly influenced by agriculture. The climate of district Kurukshetra is characterized by hot summer (mid-March to end of June), extremely cold winter (mid-November to mid-March) and with moderate rainfall (end of June to mid of September). Temperature of the area is high as 48° C in summer and as low as 1° C in winter.

METHODOLOGY:

Proposed study was carried out in tehsil Pehowa of district Kurukshetra from January, 2010 to December, 2012. In tehsil Pehowa, five rural open areas/rural residential premises, namely, Gauchard (PV_l), Dhanipura (PV_2), Bhatta majra (PV_3), Nipura (PV_4) and Khadaspur (PV_5); five ware houses/rice sellers/godowns, namely, HAFED1 (PG_1), HAFED2 (PG_2), Satara rice seed store godowns (PG_3), Seth tara chand seed store (PG_4) and Govt. ware house, Pehowa (PG_5) were selected. Besides these, five number of transects (T1, T2, T3, T4 and T5) in agricultural lands and two areas of fallow lands (FL1 and FL2) were selected in tehsil Pehowa (Fig. 2).

During the present study, scan sampling method (Altman, 1974) was used in the proposed rural open areas/rural residential premises, ware houses/rice shellers/godowns, fallow lands, and line transect method (Sale and Berkmuller, 1988) was used in agricultural areas to record the flock size and flock composition of house sparrow. Each type of flock/individuals are age-sex wise classify and later categorized into four types *i.e.,* all male flocks (AMF), all female flocks (AFF), mixed male-female flocks (MMF) and male-female with youngones flock (MFY) following Robinson *et al.,* 2005 (Table 1 and 2).

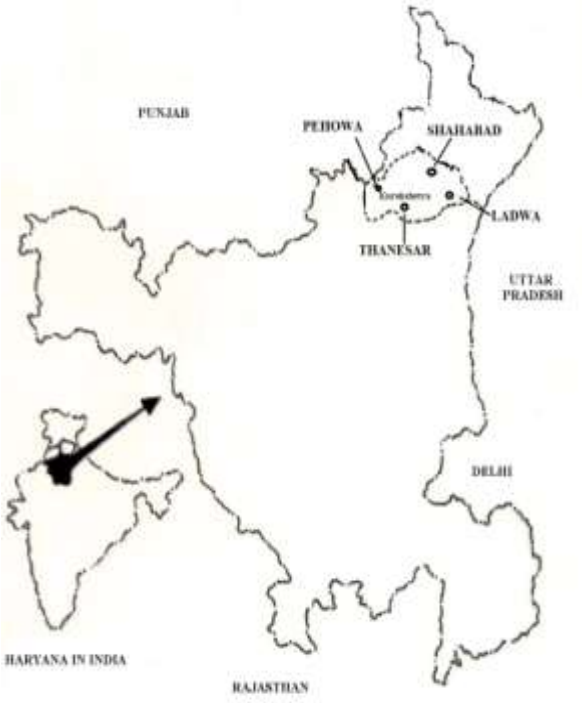


Fig. 1. Location of tehsil Pehowa of district Kurukshetra, Haryana (India).

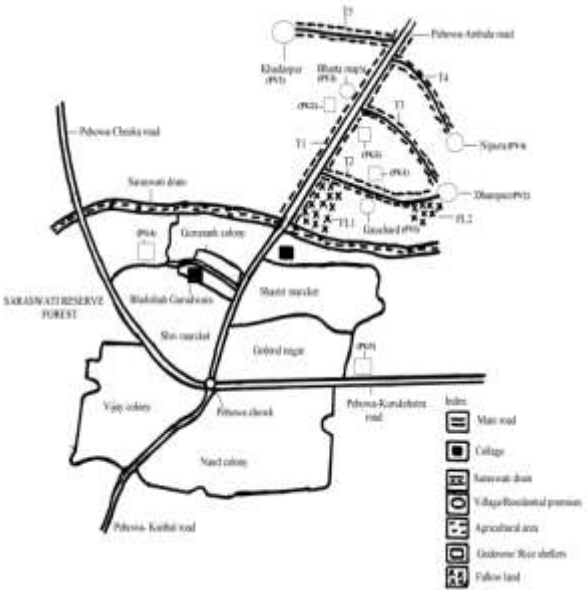


Fig. 2. Selected four types of habitats in tehsil Pehowa of district Kurukshetra.

Table 1. Age-sex wise classification of house sparrow, *Passer domesticus* (adult male, adult female and youngones) (after, Goyal, 2005).

Age class	Identification Marks	Wing span (centimeter)	Body length (centimeter)	Body weight (gram)
Adult male	Grey crown, black colored patches on wings, black bill, bib present, grayish side on neck and under parts	25 cm.	16 cm.	30-35 gm
Adult female	Grey-brown crown, dull yellow bill, grayish-white throat and under parts, black and tawny streaks on back	22 cm.	14 cm.	30-32 gm
Youngones	Black-blue streaks on body parts, yellowish eyelid	11 cm.	8 cm.	10-15 gm

Table 2. Flock composition of house sparrow, *Passer domestics* classified following by Robinson *et al.* (2005).

S. N.	Types of flock	Characterized
1	All male flocks (AMF)	All individuals in the flock included adult males.
2	All female flocks (AFF)	All individuals in the flock included adult females.
3	Mixed male-female flocks (MMF)	Flock included adult males and adult females.
4	Male-female with youngones flock (MFY)	Flock included adult males, adult females with youngones (Y).

During the present study, two flocks were considered distinct, if they had been separated by a distance greater than greatest width of either of the units as seen from the transect position (Barette, 1991). Mean flock size was later calculated following Arcese *et al.* (1995) using the given formula:

$$\text{Mean flock size} = \frac{\text{Total numbers of house sparrow seen}}{\text{Number of flock sightings}}$$

RESULTS AND DISCUSSION

House sparrow, *Passer domesticus* (Linnaeus, 1758), being social bird, generally sighted in flocks of variable size (Anderson and Ted, 2006; Kalmbach, 2007; Rostell *et al.*, 2007; Mortin, 2008; Nakagawa *et al.,* 2009; Karin *et al.,* 2011 and Neff, 2011). In the present study, a total numbers of 110 flocks of house sparrow, i.e., 55 flocks (in the year 2010) and 55 flocks (in the year 2011) were recorded in selected rural open areas/rural residential premises (Fig. 3). Variations in the numbers of sighted 110 flocks of house sparrows is concerned, it varied from minimum 3 (August, 2010; October, 2010 and November, 2010) to maximum 6 (February, 2010 and March, 2010) and minimum 4 (January, 2011; February, 2011; May, 2011 and December, 2011) to maximum 7 (October, 2011) were recorded in selected rural open areas/rural residential premises (Fig. 3). Similarly, in selected ware houses/rice shellers/godowns, a total numbers of 22 flocks, i.e., 12 flocks in year 2010 while 10 blocks in year 2011 were recorded. Variable numbers of flocks were also recorded in selected ware houses/rice shellers/ godowns. During periodic visits from January, 2010 to December, 2010, numbers of flocks varied form minimum 1 (January, March, June, August, October and November, 2010) to maximum 2 (April, May and September, 2010) in tehsil Pehowa (Fig. 4). Similarly during periodic visits from January, 2011 to December, 2011, in selected ware houses/rice shellers/godowns, number of flocks varied from minimum 1 (January, March, June, August, September and November, 2011) to maximum 2 (February and December, 2011) in tehsil Pehowa (Fig. 4). Similarly in selected agricultural areas, 8 flocks of house sparrow i.e., 5 flocks in the year 2010 and 3 flocks in the year 2011 were recorded. Only single flock (January, 2010; April, 2010; May, 2010; September; 2010; and October, 2010; April, 2011; May, 2011; June, 2011 and October, 2011) was recorded in selected agricultural areas of tehsil Pehowa (Fig. 5).

Earlier researcher like Turbins (2004) and Liker (2009) recorded that the solitary males were often sighted in the month of August to January (non-breeding period). In the present study also, solitary males were observed throughout the year but more frequently in autumn season, *i.e.,* September to November, the non-breeding period of house sparrow. House sparrows are highly social birds and their flocks usually consist of 10 to 30 or more individuals while youngones were observed during breeding season (Anderson, 2006). Novotony (1998), Cordero (2006) and Bent (2010) also reported that mixed male-female flocks were sighted maximum in all the seasons in whole years.

A number of researcher such as Bhattacharya *et al.,* 2008; Deniels, 2008; Joshi, 2009; Khera *et al.,*

2010 recorded seasonal variation number of House sparrow, *Passer domesticus* in various habitats. Similarly, In selected rural open areas**/**rural residential premises in tehsil Pehowa, during the year 2010, 13, 19, 15 and 12 flocks of variable size were recorded during winter, summer, monsoon and autumn seasons, respectively while in the year 2011, 12 flocks (winter season), 15 flocks (summer season), 15 flocks (monsoon season) and 15 flocks (autumn season) were observed (Fig. 6a). In selected ware houses/rice shellers/godowns , in the year 2010, 1, 5, 2 and 4 flocks of variable size were recorded during winter, summer, monsoon and autumn seasons, respectively while in the year, 2011, 5 flocks (winter season), 1 flock (summer season), 2 flocks (monsoon season) and 2 flocks (autumn season) were recorded (Fig. 6b). Also, in selected agricultural areas, dsuring the year 2010, 1, 2 and 2 flocks of variable size were recorded during winter, summer and autumn seasons respectively while in the year 2011, 2 flocks (summer season) and 1 flock (autumn season) were recorded (Fig. 6c). In selected agricultural areas, any single flocks was not sighted during monsoon, 2010 and winter, 2011 seasons (Fig. 6c).

Harrison (2001) has earlier also reported the sighting of 68% of house sparrow flocks from rural areas and only 32% of flocks from variable areas. Robinson *et al.* (2005) recorded maximum 72 flocks belonging to 3 types (4 all male flocks, 11 all-female flocks, 57 mixed male female flocks) in rural areas. Mortin (2008) has also reported predominant existence of flocks of house sparrows from rural areas than from suburban areas and urban areas; numbers varying from minimum 53 to maximum 84 in Anekal, Doddajhala, Thippagondanahalli (rural areas), minimum 26 to maximum 42 in Gottigere, Tavarekera, Yelahanka (suburban areas) and minimum 15 to maximum 19 Shivajinagra, KBS and Basaveshwarangara (urban areas) in Bangalore. Earlier findings indicate that flocks of house sparrows were sighted maximum in rural human habitation than in urban habitations (Summer-Smith, 1988; Fitzwater, 1988; Anderson and Ted, 2006; Mortin, 2008 and Neff, 2011).

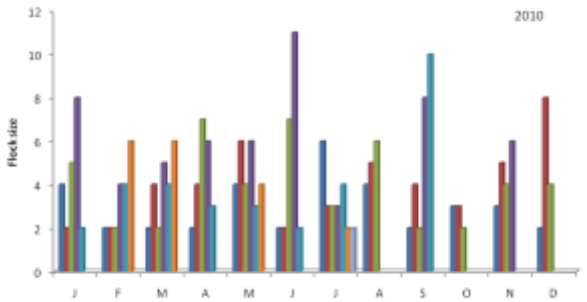
In selected rural open areas**/**rural residential premises, out of observed 110 flocks, 11 all male flocks (AMF), 34 all-female flocks (AFF), 62 mixed male-female flocks (MMF) and 2 male-female with youngones flocks (MFY) (Table 3 and 4). Out of 11 all male flocks (AMF), maximum 4 were observed in autumn season and minimum 2 in summer and monsoon seasons (Fig. 6a). Size of all male flock (AMF) ranged between 2-3 in all the seasons (Table 5). Similarly, out of 34 all-female flocks (AFF) size varied from minimum 7 in summer season to maximum 10 in winter and autumn seasons. Flock size of all female flocks (AFF) varied between 2-6 (Table 5). As far as mixed male-female flocks (MMF) were concerned, 14, 17, 15 and 16 flocks were recorded in winter, summer, monsoon and autumn seasons respectively in selected rural open areas/rural residential premises in tehsil Pehowa of district Kurukshetra (Fig. 6a; Table 3 and 4). In winter season, 14 flocks comprised 2 male-3 female mixed (1 in number), 2 male-6 female mixed (2 in number), 1 male-1 female mixed (1 in number), 2 male-2 female mixed (2 in number), 1 male-3 female mixed (4 in number), 3 male-3 female mixed (1 in number), 2 male-4 female mixed (1 in number) and 4 male-2 female mixed (2 in number). Similarly, in summer season, 1 male-1 female mixed (1 in number), 2 male-2 female mixed (1 in number), 1 male-3 female mixed (5 in numbers), 1 male-4 female mixed (3 in number), 2 male-4 female mixed (5 in number), 2 male-5 female mixed (1 in number) and 3 male-7 female mixed flock (1 in number) were sighted during study period. In monsoon season, sighted 15 flocks were constituted of 2 male-3 female mixed (1 in number), 2 male-6 female mixed (1 in number), 1 male-1 female mixed (1 in number), 1 male-3 female mixed (5 in number), 1 male-4 female mixed (1 in number), 2 male-4 female mixed (2 in number), 3 male-4 female mixed (2 in number), 3 male-8 female mixed (1 in number) and 1 male-2 female mixed (1 in number) flocks. During autumn season, a total of 16 male-female mixed flocks were observed which includes, 2 male-3 female mixed (1 in number), 2 male-6 female mixed (1 in number), 1 male-1 female mixed (4 in number), 1male-3 female (3 in number), 3 male-3 female mixed (1 in number), 1 male-4 female mixed (1 in number), 2 male-4 female mixed (2 in number), 1 male-2 female mixed (2 in number) and 4 male 6 female mixed (1 in number) flocks (Tables 4.11 and 4.12). Mixed male-female flock (MMF) size ranged between 2-11 in all the seasons (Table 3 and 4). The largest size of 3 males and 8 females was sighted in the month of June, 2010 (Table 3). Only 2 male-female with youngones flocks (MFY) were sighted during the breeding season (summer, 2010 and 2011) in selected rural open areas/rural residential premises in tehsil Pehowa of district Kurukshetra (Tables 3 and 4). The flock size ranged between 2-3 (Table 5).

Similarly, in tehsil Pehowa, 22 out of sighted flocks, 1 all male flock (AMF), 6 all-female flocks (AFF) and 15 mixed male-female flocks (MMF) (Tables 3 and 4). Out of 1 all male flock (AMF) observed in month of August, 2011 (Fig. 4). Only single all male flock (AMF) (with size 2) was recorded (Table 3 and 4). Out of 6 all-female flock (AFF), size varied from minimum 1 in monsoon and autumn seasons to maximum 2 in winter and summer seasons (Fig. 6b). Flock size of all female flocks (AFF) was varied between 2-3 (Table 6). As far as mixed male-female flocks (MMF) was concerned, 4, 4, 3 and 4 flocks were recorded in winter, summer, monsoon and autumn seasons respectively in selected ware houses/rice shellers/godowns in tehsil Pehowa of district Kurukshetra (Fig. 6b). In winter season, 4 flocks

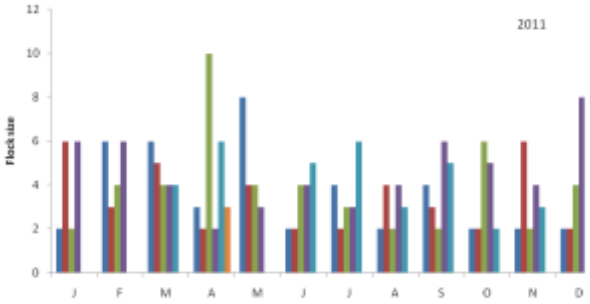
comprised of 1 male-2 female mixed (2 in number) and 1 male-1 female mixed (2 in number). Similarly, in summer season, 1 male-3 female mixed (1 in number), 1 male-1 female mixed (1 in number) and 1 male-2 female mixed (1 in number) flocks were recorded during study period. In monsoon season, 3 sighted flocks constituted of 1 male-2 female mixed (2 in number) and 1 male-3 female mixed (1 in number) flocks. During autumn season, a total of 5 male-female mixed flocks were sighted which included, 1 male-1 female mixed (1 in number), 1male-2 female (2 in number) and 2 male-2 female mixed (2 in number) flocks (Tables 3 and 4). Mixed male-female (MMF) flocks size ranged between 2-4 (Table 3 and 4). The largest size of 1 males- 3 females flock was recorded in the months of March and June, 2010 while 2 male-2 female in month of November, 2011 (Tables 3 and 4). Not any male-female with youngones flock (MFY) was sighted in selected ware houses/rice shellers/godowns in tehsil Pehowa of district Kurukshetra (Table 6).

Similarly in selected agricultural areas, out of 8 sighted flocks, 5 all-female flocks (AFF) and 3 mixed male-female flocks (MMF) (Fig. 6c; Table 3 and 4). Not a single all male flock (AMF) and male-female with youngones flocks (MFY) were sighted in selected agricultural areas in tehsil Pehowa of district Kurukshetra (Table 3 and 4). Out of 5 all-female flocks (AFF), varied from minimum 1 in winter season to maximum 2 in summer and autumn seasons. Flock size of all female flock (AFF) varied between 2-3 (Table 3 and 4). As far as mixed male-female flocks (MMF) was concerned, 2 flocks were recorded in summer season and 1 flock in autumn season in selected agricultural areas of tehsil Pehowa of district Kurukshetra (Table 3 and 4). In summer season, 2 flocks were constituted of 1 male-2 female mixed (2 in number) flock and in autumn season, I flock was comprised of 1 male-2 female mixed (1 in number) (Table 3 and 4). Size of mixed male-female (MMF) flocks ranged between 2-3 (Table 3 and 4). The largest size of 1 males- 2 females flock was sighted in the months of April and September, 2010 and April, 2011 (Table 3 and 4).

Summer-Smith, 1988; Fitzwater, 1988; Anderson and Ted, 2006; Mortin, 2008 and Neff, 2011 recorded youngones of house sparrows with their parents during only the breeding seasons. Also in the present study, all male flocks (AMF), all female flocks (AFF), mixed male-female flocks (MMF) were sighted throughout the year, whereas, male-female with youngones flocks (MFY) were sighted only during the breeding season in all the selected habitats *viz.,* rural open areas**/**rural residential premises, ware houses/rice shellers/godowns and agricultural areas in tehsil Pehowa of district Kurukshetra. In all, 2 fallow lands of variable size regarding flocks size and composition were surveyed in Pehowa tehsil of district Kurukshetra. The result revealed that not a single individual of adult male (AM), adult female (AF) and youngones (YN) of house sparrows were recorded in these fallow lands.



(a)

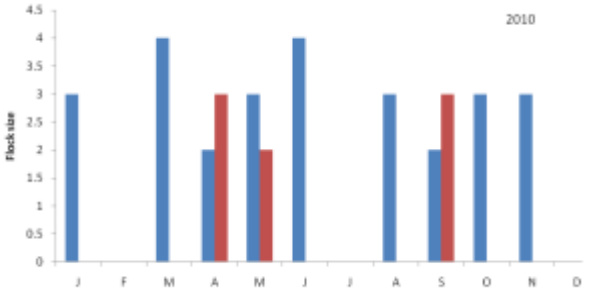


(b)

Number on X- axis each bar represents one flock.

J-January, F-February, M-March, A-April, M-May, J-June, J-July, A-August, S-September, O-October, N-November, D-December.

Fig. 3. Number of flocks sighted/visit and number of house sparrows sighted/flock in selected rural open areas/rural residential premises in tehsil Pehowa of district Kurukshetra, (a) from January, 2010 to December, 2010 and (b) from January, 2011 to December, 2011.



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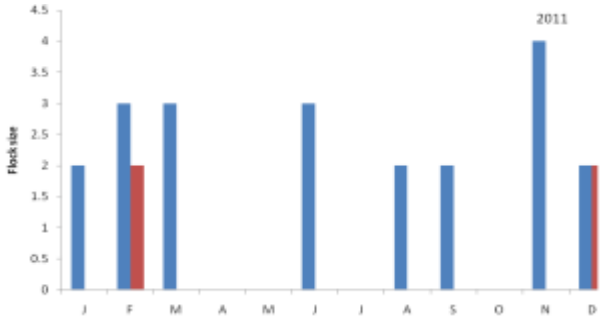
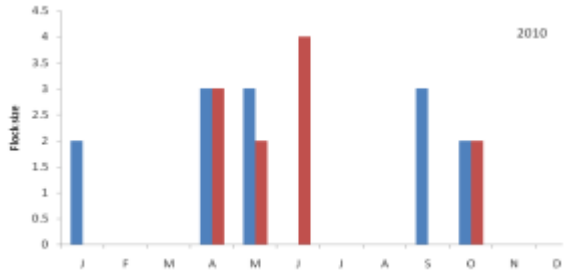


(b)

Number on X- axis each bar represents one flock.

J-January, F-February, M-March, A-April, M-May, J-June, J-July, A-August, S-September, O-October, N-November, D-December.

Fig. 4. Number of flocks sighted/visit and number of house sparrows sighted/flock in selected ware houses /rice shellers/godowns in tehsil Pehowa of district Kurukshetra, (a) from January, 2010 to December, 2010 and (b) from January, 2011 to December, 2011.



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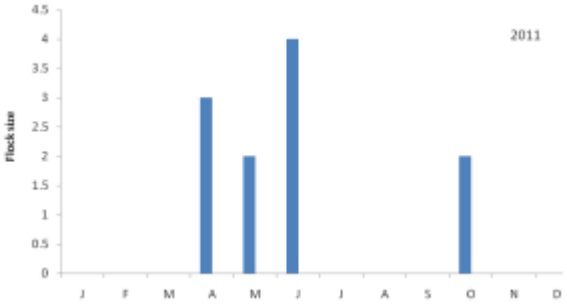
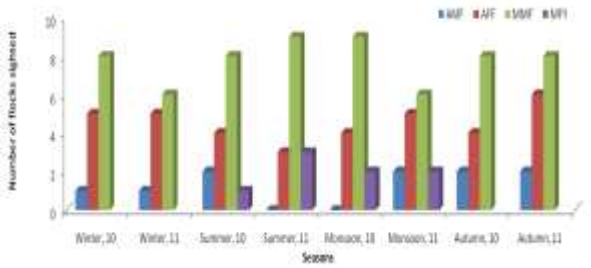


(b)

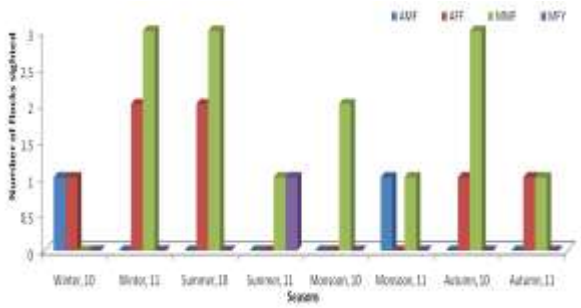
Number on X- axis each bar represents one flock.

J-January, F-February, M-March, A-April, M-May, J-June, J-July, A-August, S-September, O-October, N-November, D-December.

Fig. 5. Numbers of flock sighted/visit and number of house sparrows sighted/flock in selected agricultural areas in tehsil Pehowa of district Kurukshetra, (a) from January, 2010 to December, 2010 and (b) from January, 2011 to December, 2011.



(a)



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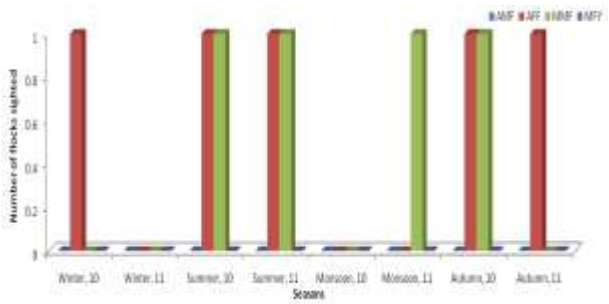

(c)

Fig. 6. Seasonal variation in numbers of flock observed in (a) selected rural open areas/rural residential premises, (b) in selected ware houses/rice shellers/godowns and (c) selected agricultural areas in Pehowa tehsil of district Kurukshetra during January, 2010 to December, 2011.

Table 3. Flock size and composition of house sparrows in selected habitats, namely, rural open areas/rural residential premises, warehouses/rice shellers/godowns and agricultural areas in tehsil Pehowa of district Kurukshetra during January, 2010 to December, 2010.

Selected habitats	Months	Number of flock sightings revealing flock size and flock composition						
		I	II	III	IV	V	VI	VII
ROA/RRP	January	2(AF)	2[AF]	5[2M3F]	8[2M6F]	2[1M3F]	-	-
	February	2[AM]	2[AF]	2[AF]	4[2M2F]	4[1M3F]	6[3M3F]	-
	March	2[AM]	4[AF]	2[AF]	5[1M4F]	4[1M3F]	6[2M4F]	-
	April	2[AM]	4[AF]	4[AF]	7[2M5F]	6[2M4F]	-	-
	May	4[AF]	6[2M4F]	4[2M2F]	6[2M4F]	3[1F2Y]	-	-
	June	2[AF]	2[AF]	7[3M4F]	11[3M8F]	2[1M1F]	-	-
	July	6[AF]	3[AF]	3[1M2F]	3[1M2F]	4[1M3F]	-	-
	August	4[1M3F]	5[1M4F]	6[2M4F]	-	-	-	-
	September	2[AM]	4[AF]	2[AF]	8[2M6F]	10[4M6F]	-	-
	October	3[1M2F]	3[1M2F]	2[1M1F]	-	-	-	-
	November	3[AM]	5[1M4F]	6[2M4F]	4[1M3F]	-	-	-
	December	2[AF]	8[2M6F]	4[1M3F]	-	-	-	-
WH/RS/G	January	3[1M2F]	-	-	-	-	-	-
	February	-	-	-	-	-	-	-
	March	4[1M3F]	-	-	-	-	-	-
	April	2[1M1F]	3[1M2F]	-	-	-	-	-
	May	3[AF]	2[AF]	-	-	-	-	-
	June	4[1M3F]	-	-	-	-	-	-
	July	-	-	-	-	-	-	-
	August	3[1M2F]	-	-	-	-	-	-
	September	2[1M1F]	3[1M2F]	-	-	-	-	-
	October	3[1M2F]	-	-	-	-	-	-
	November	3[AF]	-	-	-	-	-	-
	December	-	-	-	-	-	-	-
AA	January	2[AF]	-	-	-	-	-	-
	February	-	-	-	-	-	-	-
	March	-	-	-	-	-	-	-
	April	3[1M2F]	-	-	-	-	-	-
	May	3[AF]	-	-	-	-	-	-
	June	-	-	-	-	-	-	-
	July	-	-	-	-	-	-	-
	August	-	-	-	-	-	-	-
	September	3[1M2F]	-	-	-	-	-	-
	October	2[AF]	-	-	-	-	-	-
	November	-	-	-	-	-	-	-
	December	-	-	-	-	-	-	-

Figures in parentheses represent flock composition.

ROA- rural open area, RRP- rural residential premises, WH- ware house, RS- Rice shellers, G- godowns, AA- agricultural areas, AM- all male, AF- all female, MMF- mixed male female, MFY- male female with youngones.

Table 4. Flock size and composition of house sparrow in selected habitats namely, rural open areas/rural residential premises, ware houses/rice shellers/ godowns and agricultural areas in tehsil Pehowa of district Kurukshetra during January, 2011 to December, 2011.

Selected Habitats	Months	Number of flock sightings revealing flock size and flock composition						
		I	II	III	IV	V	VI	VII
ROA/RRP	January	2[AF]	2[AF]	6[2M4F]	6[4M2F]	-	-	-
	February	6[AF]	3[AF]	4[1M3F]	6[2M4F]	-	-	-
	March	6[AF]	5[1M4F]	4[1M3F]	4[1M3F]	-	-	-
	April	3[AF]	2[AF]	10[3M7F]	2[1M1F]	6[2M4F]	-	-
	May	8[2M6F]	4[1M3F]	4[1M3F]	2[1F1Y]	-	-	-
	June	2[AM]	2[AF]	4[1M3F]	4[2M2F]	5[2M3F]	-	-
	July	4[AF]	3[AF]	6[4M2F]	-	-	-	-
	August	2[AM]	4[AF]	2[AF]	4[1M3F]	3[1M2F]	-	-
	September	4[AF]	3[AF]	2[AF]	5[2M4F]	5[2M3F]	-	-
	October	2[AM]	2[AF]	2[1M1F]	2[1M1F]	2[1M1F]	4[1M3F]	3[1M2F]
	November	2[AM]	2[AF]	6[AF]	4[1M3F]	4[1M3F]	-	-
	December	2[AM]	2[AM]	4[2M2F]	4[1M3F]	-	-	-
WH/RS/G	January	2[AF]	-	-	-	-	-	-
	February	3[1M2F]	2[1M1F]	-	-	-	-	-
	March	3[1M2F]	-	-	-	-	-	-
	April	-	-	-	-	-	-	-
	May	-	-	-	-	-	-	-
	June	3[1M2F]	-	-	-	-	-	-
	July	-	-	-	-	-	-	-
	August	2[AM]	-	-	-	-	-	-
	September	2[AF]	-	-	-	-	-	-
	October	-	-	-	-	-	-	-
	November	4[2M2F]	-	-	-	-	-	-
	December	2[AF]	2[1M1F]					
AA	January	-	-	-	-	-	-	-
	February	-	-	-	-	-	-	-
	March	-	-	-	-	-	-	-
	April	3[1M2F]	-	-	-	-	-	-
	May	2[AF]	-	-	-	-	-	-
	June	-	-	-	-	-	-	-
	July	-	-	-	-	-	-	-
	August	-	-	-	-	-	-	-
	September	-	-	-	-	-	-	-
	October	2[AF]	-	-	-	-	-	-
	November	-	-	-	-	-	-	-
	December	-	-	-	-	-	-	-

Figures in parentheses represent flock composition.

ROA- rural open area, RRP- rural residential premises, WH- ware house, RS- Rice shellers, G- godowns, AA- agricultural areas, AM- all male, AF- all female, MMF- mixed male female, MFY- male female with youngones.

Table 5. Flock sightings, their range and mean flock size±S.E. in different seasons in selected rural open areas/rural residential premises in tehsil Pehowa of district Kurukshetra during January, 2010 to December, 2011.

	Flock type		Winter	Summer	Monsoon	Autumn
From January, 2010 to December, 2010	AMF	Total	1	2	-	2
		Range	2	2-2	-	2-3
		Mean±S.E.	2.00±0.00	2.00±2.00	-	1.52±0.88
	AFF	Total	5	4	4	4
		Range	2-4	2-4	2-6	2-6
		Mean±S.E.	2.40±0.40	3.50±0.50	3.25±0.94	3.00±1.00
	MMF	Total	8	6	9	8
		Range	2-8	4-7	2-11	2-10
		Mean±S.E.	5.12±0.74	5.50±0.37	5.00±0.91	5.12±0.97
	MFY	Total	-	1	-	-
		Range	-	3	-	-
		Mean±S.E.	-	3.00±0.00	-	-
From January, 2011 to December, 2011	AMF	Total	2	-	2	2
		Range	2-2	-	2-2	2-3
		Mean±S.E.	2.00±0.00	-	2.00±0.00	1.52±0.88
	AFF	Total	5	3	3	6
		Range	2-6	2-6	2-4	2-6
		Mean±S.E.	3.00±0.40	3.66±1.20	3.00±1.20	3.00±0.57
	MMF	Total	6	11	6	8
		Range	4-8	2-10	3-6	2-6
		Mean±S.E.	5.12±0.74	5.50±0.37	5.00±0.91	5.12±0.97
	MFY	Total	-	2	-	-
		Range	-	2	-	-
		Mean±S.E.	-	2.00±0.00	-	-

AMF-All male flock, AFF-all female flock, MMF-male-female mixed flock, MFY-male-female with youngones.

Table 6. Flock sightings, their range and mean flock size±S.E. in different seasons in selected ware houses/rice shellers/godowns in tehsil Pehowa of district Kurukshetra during January, 2010 to December, 2011.

	Flock type		Winter	Summer	Monsoon	Autumn
From January, 2010 to December, 2010	AMF	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-
	AFF	Total	-	2	1	-
		Range	-	2-3	3	-
		Mean±S.E.	-	2.50±0.50	3.33±0.33	-
	MMF	Total	1	3	2	3
		Range	3	2-4	3-4	2-3
		Mean±S.E.	3.00±0.33	3.00±0.57	3.50±0.50	2.66±0.33
	MFY	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-
From January, 2011 to December, 2011	AMF	Total	-	-	1	-
		Range	-	-	2	-
		Mean±S.E.	-	-	2.00±0.00	-
	AFF	Total	2	-	-	1
		Range	2-2	-	-	2
		Mean±S.E.	2.00±0.00	-	-	2.00±0.00
	MMF	Total	3	1	1	1
		Range	2-3	3	4	2
		Mean±S.E.	2.66±0.20	3.00±0.00	4.00±0.00	2.00±0.00
	MFY	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-

AMF-All male flock, AFF-all female flock, MMF-male-female mixed flock, MFY-male-female with youngones.

Table 7. Flock sightings, their range and mean flock size±S.E. in different seasons in selected agricultural areas in tehsil Pehowa of district Kurukshetra during January, 2010 to December, 2011.

	Flock type		Winter	Summer	Monsoon	Autumn
From January, 2010 to December, 2010	AMF	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-
	AFF	Total	1	1	-	1
		Range	2	3	-	2
		Mean±S.E.	2.00±0.00	3.00±0.00	-	2.00±0.00
	MMF	Total	-	1	-	1
		Range	-	3	-	3
		Mean±S.E.	-	3.00±0.00	-	3.00±0.00
	MFY	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-
From January, 2011 to December, 2011	AMF	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-
	AFF	Total	-	1	-	1
		Range	-	2	-	2
		Mean±S.E.	-	2.00±0.00	-	2.00±0.00
	MMF	Total	-	1	-	-
		Range	-	3	-	-
		Mean±S.E.	-	3.00±0.00	-	-
	MFY	Total	-	-	-	-
		Range	-	-	-	-
		Mean±S.E.	-	-	-	-

AMF-All male flock, AFF-all female flock, MMF-male-female mixed flock, MFY-male-female with youngones.

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