Pakistan J. Zool., vol. 52(1), pp 409-412, 2020. **DOI**: https://dx.doi.org/10.17582/journal.pjz/2020.52.1.sc11

Short Communication

Distribution and Abundance of Vertebrate Pests of Cultivated Maize and their Eco-Friendly Management in District Bagh, Azad Jammu and Kashmir, Pakistan

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Article Information
Received 08 October 2018
Revised 14 May 2019
Accepted 10 Jun 2019
Available online 04 November 2019

Authors' Contributions
AHF presented the main idea of research. FA arranged the funding and supervised the research. MH did statistical analysis. LZF conducted lab work.

Key words
Small mammals, Xlstat, Large mammals, Trapping, Seedling stage.

ABSTRACT

The present study was conducted to document distribution and abundance of vertebrate pests in District (Bagh), Azad Kashmir. The study was conducted in three areas (Harighel fields, Grid colony fields and Iqbal colony fields during mid April to mid December 2017 by selecting 5 model plots of maize. On each study site, line transect method for small mammalian pest, for large mammals spot light count and for birds point count methods were used to determine abundance of each species. The study, documented 10 species of mammalian pests, 13 species of pest birds of maize crop and their population density differed significantly ($P \leq 0.05$) at study sites. The habitat analysis of study sites and correlation of species with habitat were done through Principal Component Analysis (PCA) by using software (XLSTAT-Ecology version). The habitat was positively correlated in the two areas while the study site Harighel fields was negatively correlated. It was also found that most species except for a few were positively correlated with habitat. The infestation of pest starts at the time of sowing and continued to post harvest stage. A properly scheduled ecofriendly approach was needed to control this infestation to prevent significant loss of maize production.

Vertebrate pests damage crops during sowing, growing, harvesting and storage in farm and household structures. Substantial amounts of food are lost annually in the post-harvest system and the loss of rice in Asia is estimated 2 to 6% of net production (Greeley, 1982). The maize crop is damaged from 9.6 to 20.2% by vertebrate pests (FAO, 1977). Rodents also harbor pathogens of 45 diseases which could kill more humans than all wars in the form of Black Death (WHO, 2000). Although some information on mammals and birds are present in Azad Kashmir such as burrowing activities of mammals, commensal rodents (Faiz *et al.,* 2018) and diversity of mammals (Faiz *et al.,* 2015; Faiz and Abbas, 2016), but little is known on vertebrate pests of cultivated crops. The present study was conducted to document vertebrate pests at different stages of maize crop.

Material and methods

For the current study, five plots were randomly selected in each of three randomly selected sites: Iqbal Colony fields, 33°59'39.70"N ,73°46'29.03"E, Harighel fields,33°56'35.00"N 73°42'0.71"E and the Grid colony field 33°58'39.84"N,73°45'47.00"E). The trapping was done from April through September for estimation of pre harvest pests and from October through December post harvest pest estimation by trap-line method (line-transect technique). A trap-line consisting of 30 trap stations laid on a straight line that the distance between the consecutive stations was 15.24 meters apart. At each of the stations, three snap traps, two rat traps and one mouse trap were set for capturing rodents described by Rudran *et al.* (1996). The traps were baited with bread with cooking oil and a few drops of oil were also rubbed on traps. Trapping nights were calculated by multiplying number of traps by number of nights. The trapping was done each month consecutively for a period of three nights and at each study site two trap lines with 30 stations was applied. The traps were set before sunset in the evening and checked before sunrise the next morning. The trapped specimens were removed and packed in plastic zipper bags and tagged with station number and sample number. The tagged samples were brought to the laboratory for identification and autopsy following the taxonomic keys of Robert (1997). The lagomorph and artiodactyl, populations were

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0030-9923/2020/0001-0409 $ 9.00/0

estimated by adapting the total count method (Sutherland, 1994). It is the average of sum of animals observed in at each site. The pest bird population was estimated by the point count method. The birds were counted, visualized and photographed in fixed radius plots (Hutto *et al.*, 1986).

Results and discussion

We recorded 23 pest species belonging to 13 families among which five species are large mammals (Table I). The percentage of variability ranged from 61.143 to 0.213, while the percentage of cumulative variability ranged from 61.143 to 100 (Fig. 1). The wild boar (*Sus scrofa*) is omnivorous and infests maize before the grain become hard and the infestation rate become high (Bueno *et al.,* 2011). The habitat of the three studies is different and also proved statistically significant (Fig. 2) and correlation of species with habitat (Fig. 3). The Indian flying-foxe (*Pterpus giganteus*) infestation rate at the study area was recorded August, September and October (Mahmood *et al.,* 2010). The russet sparrow (*Passer cinnamomeus*), infests crops at the time of sowing, seedling and post harvest (Summers *et al.,* 1988). The rose-ringed parakeet (*Psittacula krameri*), feeds on buds, fruits, vegetables, nuts, berries, and causes significant economic losses (Jassra and Rafi, 2003). The plum-headed parakeet (*Psittacula cyanocephala*) has a wide feeding niche of cultivated crops, orchids and damage maize cobs and seeds (Dvir, 1985). The house crow (*Corvus splendens*), damages cultivations,

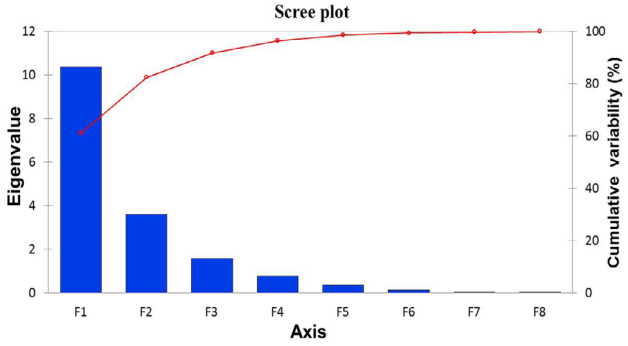

Fig. 1. PCA screen plot showing Eigen values.

Table I.- Comparison of population density at fields.

No.	Common names	Scientific names	Iqbal Colony fields	Grid Colony fields	Harighel fields
Large mammals					
1	Indian wild boar	*Sus scrofa*	3.22±1.15	7.22±1.25	10.42±1.35
2	Rhesus macaque	*Macca mulatta*	-	-	13.33±6.87
3	Indian crested porcupine	*Hystrix indica*	4.22±1.75	6.1±2.51	8.77±2.4
4	Royle's Pika	*Ochotona rufescene*	6.0 ±2.4	8.1±2.51	12.6±3.21
5		*Pterpus giganteus*	116.8±6.4	133.2±6.6	257.1±8.6
Small mammals					
1	House mouse	*Mus. musculus*	36.2 ±9.64	45.8 ±10.5	66.1±9.6
2	Roof rat	*Rattus rattus*	6.22±1.3	8.5 ±2.1	16.22±1.3
3	Kashmir field mouse	*Apodemus rusigus*	29.44 ±15.3	37.7 ±8.9	49.44 ±15.38
4	Asian house shrew	*Suncus murinus*	7.88 ±1.5	18.4 ±1.6	27.88 ±1.57
5	Lesser bandicoot rat	*Bendicota bengalensis*	5.11 ±1.01	6.2 ±1.5	7.11±1.01
Birds					
1	Cinnamon tree sparrow	*Passer cinnamomeus*	38.6±10.8	40.6±12.58	43.6±12.50
2	Russet sparrow	*Passer rutilans*	41.6±12.85	55.2±1.3	70.44±14.71
3	Eurasian tree sparrow	*Passer montanus*	53.55±12.52	64.55±12.52	84.55±10.52
4	House sparrow	*Passer domesticus*	73.55±11.52	83.5±11.5	121.11±12.04
5	Yellow-billed blue magpie	*Urocissa flavirostris*	10.44±2.12	33.6±2.43	56.6±2.9
6	House crow	*Corvus splendens*	23.33±5.52	38.3±5.5	53.33±5.5
7	Alexandrine parakeet	*Psittacula eupatria*	24.44±8.9	37.7±9.9	51.11±10.19
8	Slaty-headed Parakeet	*Psittacula himalayana*	21.11±6.05	31.1±6.05	34.44±6.79
9	Rock pigeon	*Columbalivia domestica*	23.33±11.14	36.6±12.21	39.44±12.84
10	Spotted dove	*Spilopelia chinensis*	29.44±4.12	44.44±4.12	69.44±4.12
11	Plum-headed parakeet	*Psittacula cyanocephala*	25.55±9.44	38.33±8.5	41.11±8.89
12	Rose-ringed parakeet	*Psittacula krameri*	23.88±4.4	36.6±8.9	39.4±9.8
13	Baya waver	*Ploceus philippinus*	21.6±5.7	37.1±6.4	50.01±6.2

Table II.- PCA values association between different components.

Values	F1	F2	F3	F4	F5	F6	F7	F8
Eigenvalue	10.394	3.615	1.598	0.794	0.367	0.143	0.052	0.036
Variability (%)	61.143	21.267	9.399	4.670	2.160	0.840	0.307	0.213
Cumulative %	61.143	82.410	91.809	96.479	98.640	99.480	99.787	100.000

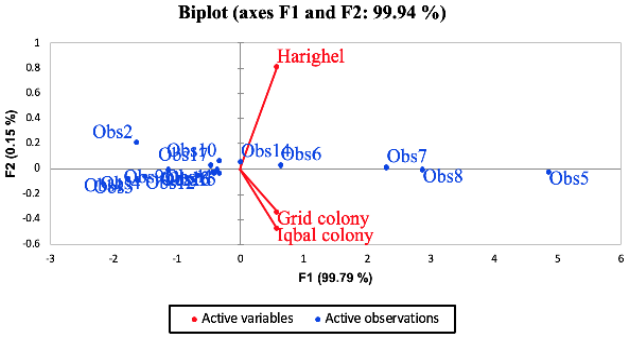

Fig. 2. PCA plot showing the habitat similarity (observations and site variable).

stored grains and causes significant economic loss (Feare *et al.,* 1990). The greatest damage to the ripened crops is due to the foraging activities of the bird species (*Ploceus philippinus*), and can reduce crop yield by more than 55% (Bruggers *et al.,* 1998). The tree sparrow (*Passer montanus*) feeds on seeds on the ground and maize cobs (Clement, 1993). The yellow-billed blue magpie (*Urocissa flavirostris*) is omnivorous, damages maize cobs. The geographic distribution of species in Azad Jammu Kashmir is reported by (Faiz *et al.,* 2015). The rock pigeon (*Columba livia*) is sighted at sowing and post-harvest of the maize crop (Thamaraiselvi *et al.,* 2015). The spotted dove (*Spilopelia chinensis*) is grainivore and is sighted at sowing and post-harvest (Shyama *et al.,* 1998). The rhesus macaque (*Macaca mulatta*) infests crops in the groups when maize grain goes to ripening which is similar in India (Rao *et al.,* 2001). The distribution of this species is reported as being abundant and is a pest by various authors (Faiz *et al.,* 2016). The Indian porcupine (*Hystrix indica*) is a pest of moist temperate forests, plantations, and cultivated land (Amori *et al.,* 2008). The infestation of Royle's pika (*Ochotona roylei*), normally occurs when maize grains are ripen. The house mouse (*Mus musculus*) infestation occurs post-harvest (Faiz *et al.,* 2016). The bandicoot rat (*Bendicota bengalensis*) infestation occurs at the sowing of seeds and they damage seedling, while a second infestation occurs at the time of post-harvest stage. They collect maize in their burrows (Faiz *et al.,* 2016). The black rat (*Rattus rattus)* shift their territory from house to fields when the abundance of food in house is less (Faiz, 2016). The Kashmir field mouse (*Apodemus rusiges*) infestation was recorded during seedling but they also raided fields at post-harvest (Faiz *et al.,* 2016). The Asian house shrew (*Suncus murinus*) feeds on plant matter such as grains, nuts, and seeds (Prakash *et al*., 1999). Our results agree with the findings of (Faiz, *et al*., 2018) who reported that the density of (*S. murinus*) in fields is high because stored cereals at human houses are exhausted.

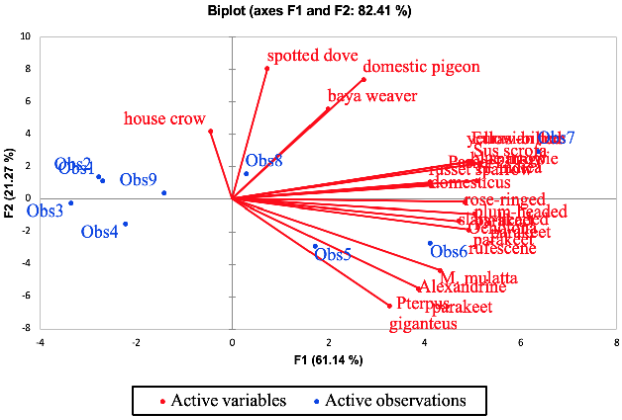

Fig. 3. PCA plot showing the distribution of different species in study sites.

Statement of conflict of interest

The authors declare no conflict of interest.

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