International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 3, Issue 3, pp: 421-425, 2018

http://www.ijzab.com

Research Article

SPATIO -TEMPORAL VARIATIONS OF ROSE-RINGED PARAKEET (*PSITTACULA KRAMERI*) DENSITY IN ARIYALUR DISTRICT, TAMIL NADU, INDIA

Subramaniyan Kannaiyan and Jaganathan Pandiyan*

Department of Zoology and Wildlife Biology, A.V.C. College (Autonomous), Mannampandal-609306,Mayiladuthurai, Tamilnadu, India.

Article History: Received 7th May 2018; Accepted 25th May 2018; Published 31st May 2018

ABSTRACT

Studies on avian communities especially cavity nesting birds are significant to understand their status and distribution in relation habitat requirements. The Rose Ringed Parakeet is one of the secondary cavity-nesting bird species. The present study was carried out in two different habitats viz., Palmyra and Coconut tree plantations. The Line transect method was applied to count the Rose Ringed Parakeet bird population in both the habitats. Temporally among three years of the study the year I (2013-14) showed the highest bird density (15.1±0.63 No./km.) and the year II (2014-15) showed the lowest bird density (13.2±0.51No/km). Spatially highest bird density was recorded in the Palmyra tree plantation than the Coconut tree plantation. The density of Rose Ringed Parakeet varied significantly between the habitats and among the years ($P<0.001$). The present study revealed that fluctuations and density of Rose Ringed Parakeet could vary spatio-temporally.

Keywords: Rose ringed parakeet, Spatial, Temporal density, Conservation.

INTRODUCTION

The rose-ringed parakeet is the altricial and secondary cavity-nesting birds in the avian communities. The population of cavity-nesting birds declined over the periods (Kannaiyan and Pandiyan, 2014). The rapid of decline in a cavity nesting birds including rose ringed parakeet due to the unfavorable nesting site and competition from non-native birds that could be a major threat to the species (Kannaiyan and Pandiayan 2014). The parakeet is considered to worst avian pest in throughout world and Indian subcontinent (Ali *et al*., 1981; Forshaw & Cooper, 1989; Gupta *et al*., 1998; Juniper & Parr, 1998; Shafi *et al*., 1986). Parakeet population recoded from some parts of South Asia, Europe, North America and some region of Africa (Roberts, 1991). Rose-ringed parakeet (*Psittacula krameri)* is one of the primary vertebrate pests in fruit orchards, cultivations and native wildlife.

Most of the Parakeet nest sites are located to the food crop area, near to the water bodies (Khan, 2002; Paton *et al*., 1982). The Rose-ringed Parakeet population depends on the availability of food and major environmental factors. The rose-ringed parakeet population depends on the availability of food, environmental factors and the food supply (Lack, 1954; Newton, 1998) but the population may be fluctuated and it influenced by the different ecological factors pertinently quality of habitats (Arscott *et al*., 2002). Habitat could directly influence the population of cavity nesting birds (Martin *et al*., 2004). The population is depending on differential habitats requirement and habitat specialization. Habitat requirements are most vulnerable to population problems from habitat change (Harcourt *et al*., 2002; Julliard *et al*., 2004; Korkeamaki & Suhonen, 2002; Munday, 2004; Warren *et al*., 2001). The relationships between habitat quality and supplemental food sources to increased population size (Kennedy *et al*., 2011; Schooley & Branch, 2011). The habitat structure is influences the distribution and abundance of populations (Bahn & McGill, 2007; Kraft *et al*., 2008).

Nevertheless the rose ringed parakeet used secondarynests as their breeding site or roosting sites. The

*Corresponding Author: Dr. Jaganathan Pandiyan, Assistant Professor, Department of Zoology and Wildlife Biology, A.V.C. College (Autonomous), Mannampandal-609306, Mayiladuthurai, Tamilnadu, India. Email: dunlinpandiyan@gmail.com

nest site is one of the most important determinants of individual fitness and population of bird species (Martin, 1995; Slobodchikoff, 1984). The nest site limitation is important to secondary cavity-nesting species. The cavities constitute key resources to some birds (Martin, 1995). Population declines in secondary cavity-nesting birds are usually attributed to habitat quality deterioration (Holt & Martin, 1997) and nest-site limitation (Newton, 1998). The availability of cavities can a limiting factor of the cavity nesting community (Von Haartman, 1957), particularly for secondary cavity nesting bird species (Newton, 1998). The number of cavities could determine the maximum number of pairs that breed in an area (Von Haartman, 1957). Cavity-nesting birds select their nest trees based not only cavity and tree level variables and larger scale context, such as surrounding vegetation and distance to forest edge (Aitken & Martin, 2004; Mahon *et al*., 2007 ; Koch *et al*., 2009; Politi *et al*., 2009). Based on the information the present study planned to collect the current status of Rose ringed Parakeet in two different habitats in relation to different years to understand the spatio-temporal variations of their population size.

MATERIALS AND METHODS

The present study carried out at two different habitats from November 2013 to April 2016. Habitat I all the tree cavities Palmyra tree (*Borassus flabellifer*), and which is located at Arulmozhi (11º 04' 09.09" N 79º 21' 34.34" E) and Habitat II Coconut tree (*Cocos nucifera*) and which is located at Karaikurichi (11º 07' 85.35" N 79º 35' 73.78" E) agricultural area, Ariyalur District, Tamilnadu, India. Both the study area is situated near by the Kollidam River. The Kollidam river is the major water suppliers for the area of 10000 hectares for the purpose of agricultural activities of in an around the Ariyalur District, Tamil Nadu. The study area dominated by agricultural lands particularly paddy, banana, cotton, sugarcane, coconut, black and green grams, gingelly, spices etc., Natural vegetation is very scarce, and includes small areas of short scrubland and other types of lands.

Methodology

The Line transects method used to count the Rose ringed Parakeet in both the study areas during the study periods. Line transect simply involve walking a straight line and counting the numbers of birds seen from the line (Bibby, 2004). By keeping moving, it is possible to cover more ground in a fixed time than by any more elaborate method, and large sample size generated efficiently. Long transects divided into small section whose habitats can be measured to asses bird/habitat relationship. The line transect surveys more accurately estimated the distribution of the population between habitats and recommended that line transects be used to estimate the numbers of parakeets (Casagrande & Beissinger, 1997). The both habitat divided into 10 transect, each transect were counted the birds from two times in each month during breeding season.

RESULTS AND DISCUSSION

The highest density of the rose-ringed parakeet (*Psittacula krameri*) recorded in the Palmyra tree habitat (15.7 ± 0.47 No./km.) when compared to the Coconut tree (12.3 ± 0.46 No./km.) (Table 1 and Figure1). The density of rose-ringed parakeet (*Psittacula krameri*) differed significantly between the habitats ($P<0.001$) (Table 1). Among the three years the Year I (2013 -2014) showed the highest bird density (15.1 ± 0.63 No./km.) and the Year II (2014-2015) showed the lowest bird density (13.2 ± 0.51No/km) (Table 2 and Figure 2). The density of rose-ringed parakeet (*Psittacula krameri*) differed significantly between the years ($P<0.001$) (Table 2). The bird density, the month of January showed highest bird density (21.08 ± 0.79No/km) and the month of April showed lowest density than the other months studied (8.7 ± .48 No./km.) There was a significant variation between the density of rose-ringed parakeet and among the months ($P<0.001$) (Table 3).

The present study revealed that the population of rose-ringed parakeet differed significantly between the habitats i.e. Palmyra and coconut tree plantation ($P<0.001$) (Table 1 and Figure1). A study explained that the different types of habitats and ecological factors might have influence the bird population either increase or decrease the bird population (Greene & Guo, 1997; Lysyk, 1993; Mullens & Meyer, 1987). Another study reported that the fluctuation of rose-ringed parakeet population depends on the following factors such as availability of food resources, biotic and abiotic factors, the sustainability of food resources and supply of food (Lack, 1954; Newton, 1998). Thomas, (1994) inferred that the habitat quality is strong influencing factor for bird population density, reproduction and growth of the species. The study observed more colonized rose ringed parakeet in both the habitats when compared to the unused habitat (Unpublished data) and it explained that the quality of the habitat is very vital for the attraction of birds especially for more aggregation of birds. Higher quality habitat sites more likely to be species recolonized (Kennedy *et al.*, 2011; Schooley & Branch, 2009) (Robles & Ciudad, 2012) and the relationships between habitat quality and supplemental food sources to increased population size (Kennedy *et al.*, 2011; Schooley & Branch, 2011).

The habitat structure is influences the distribution and abundance of populations (Bahn & McGill, 2007; Kraft *et al*., 2008). A study stated that the habitat requirements are most vulnerable to a bird population from habitat change

(Harcourt *et al*., 2002; Warren *et al*., 2001; Korkeamaki & Suhonen, 2002; Julliard *et al*., 2004; Munday 2004). The density of rose-ringed parakeet (*Psittacula krameri*) differed significantly among the years and months (P<0.001) (Tables 2, 3). The many communal roosting populations varied in a particular month, season and years, it might have due to temporal variations of environmental factors (Haase, 1963). Another study indicated that the annual variation of bird population influenced by the local weather condition, habitat structure and abundance and distribution of food. Several studies informed that the individual bird populations of many tropical species frequently move over large areas to follow temporal and spatial changes in food resources (Blake & Loiselle, 1990).

Table 1. Bird density (No./km.) of Rose-ringed Parakeet (*Psittacula krameri*) recorded in two different habitats from November 2013 to April 2016. (Values are Mean and SE).

S. No.	Habitat	Density (No./km.)	P. value
1	Palm tree	15.7±0.47	P<0.001
2	Coconut tree	12.3±0.46	P<0.001

Table 2. Annual variations of bird density (No./km.) of Rose-ringed Parakeet (*Psittacula krameri*) recorded in two different habitats from November 2013 to April 2016. (Values are Mean and SE).

S. No.	Years	Density (No./km.)	P. value
1	2013-2014	15.1 ± 0.63	P<0.001
2	2014-2015	13.2 ± 0.51	P<0.001
3	2015-2016	13.7 ± 0.61	P<0.001

Table 3. Monthly variations of bird density (No./km.) of Rose-ringed Parakeet (*Psittacula krameri*) recorded in two different habitats from November 2013 to April 2016. (Values are Mean and SE).

S. No.	Months	Density (No./km.)	P. value
1	November	10.9 ± 0.61	P<0.001
2	December	16.4 ± 0.69	P<0.001
3	January	21.1 ± 0.79	P<0.001
4	February	15.8 ± 0.70	P<0.001
5	March	11.2 ± 0.57	P<0.001
6	April	8.7 ± 0.48	P<0.001

The current study further showed that maximum density recorded for the month of January than the April month. It might be due to during the April the rose ringed parakeet begins their breeding session and the Parakeets critically facing new fledglings in their nest it may be the reason the declining of bird population particularly April month. A study reported that the abundance of bird species is largely influenced by the spatiotemporal distribution of some key environmental resources (McCain, 2009). In addition to that the seasonality plays a major role in determining the abundance and distribution of birds because the seasonality affects food and cover availability of bird population, which in turn affects breeding success and ultimately survival of the bird species (Mengesha & Bekele, 2008). The current results and the previous reports clearly indicated that the quality of the habitat is most essential factor for the birds especially cavity nesting birds to meet out their regular survival.

CONCLUSION

The study inferred that the viability and sustainability of rose ringed parakeet population can be determined by the nature of the habitat and rose ringed parakeet population can be varied among the months and years which means the month and years can also influence the density of rose ringed parakeet.

ACKNOWLEDGMENT

The authors express sincere thanks to Department of Higher Education, Government of Tamil Nadu for providing merit scholarship during the study. We also express our sincere thanks to the Department of Zoology and Wildlife Biology, A.V.C. College (Autonomous), Mannampandal, Mayiladuthurai, Tamilnadu, India for their help during the research work.

REFERENCES

Aitken, K.E., & Martin, K. (2004). Nest cavity availability and selection in aspen conifer groves in a grassland landscape. *Canadian Journal of Forest Research, 34*(10), 2099-2109.

Ali, M., Rao, B., Rao, M., & Rao, P. (1981). Bird (Psittacula krameri) damage to maize. *Journal of Bombay Natural History Society, 79*, 201-204.

Arscott, D.B., Tockner, K., van der Nat, D., & Ward, J. (2002). Aquatic habitat dynamics along a braided alpine river ecosystem (Tagliamento River, Northeast Italy). *Ecosystems, 5*(8), 0802-0814.

Bahn, V., & McGill, B. J. (2007). Can niche-based distribution models outperform spatial interpolation? *Global Ecology and Biogeography, 16*(6), 733-742.

Bibby, C.J. (2004). Bird diversity survey methods. *Bird ecology and conservation: A handbook of techniques. Oxford University Press, Oxford*, 1-15.

Blake, J.G., Stiles, F.G., & Loiselle, B.A. (1990). Birds of La Selva Biological Station: habitat use, trophic composition, and migrants. *Four neotropical rainforests*, 161-182.

Casagrande, D.G., & Beissinger, S.R. (1997). Evaluation of four methods for estimating parrot population size. *Condor*, 445-457.

Cornelius, C. (2008). Spatial variation in nest-site selection by a secondary cavity-nesting bird in a human-altered landscape. *The condor, 110*(4), 615-626.

Forshaw, J.M., & Cooper, W.T. (1989). *Parrots of the world*: Blandford London.

Greene, G., & Guo, Y. (1997). Integrated stable fly (Stomoxys calcitrans) management in confined cattle feedlots. *Recent Research and Development in Entomology, 1*, 243-250.

Gupta, M., Rajan, B., & Baruha, R. (1998). Bird damage to sugarcane. *Indian Journal of Sugar, 46*, 950-956.

Haase, B.L. (1963). The winter flocking behavior of the Common Crow (Corvus brachyrynchos Brehm). *Ohio Journal of Science*, 63, (4),1-8.

Harcourt, A.H., Coppeto, S., & Parks, S. (2002). Rarity, specialization and extinction in primates. *Journal of Biogeography, 29*(4), 445-456.

Holt, R. F., & Martin, K. (1997). Landscape modification and patch selection: the demography of two secondary cavity nesters colonizing clearcuts. *The Auk*, 443-455.

Julliard, R., Jiguet, F., & Couvet, D. (2004). Common birds facing global changes: what makes a species at risk? *Global Change Biology, 10*(1), 148-154.

Juniper, P., & Parr, M. (1998). Parrots: A Guide to Parrots of the World. Yale University Press, New Haven.

Kannaiyan, S. and. J.Pandiyan. (2014). Nesting behaviour of Psittacula krameri L. *Scientific Transactions in Environment and Technovation, 7*(4), 201-204.

Kennedy, C.M., Grant, E.H.C., Neel, M.C., Fagan, W.F., & Marra, P.P. (2011). Landscape matrix mediates occupancy dynamics of Neotropical avian insectivores. *Ecological Applications, 21*(5), 1837-1850.

Khan, H. (2002). Foraging, feeding, roosting and nesting behaviour of the rose-ringed parakeet (Psittachula kameri) in the cultivations of central Punjab, *Pakistan Journal of Biological Science*, 1, 37-38.

Koch, A., Munks, S., & Driscoll, D. (2009). The use of hollow-bearing trees by vertebrate fauna in wet and dry Eucalyptus obliqua forest, Tasmania. *Wildlife Research, 35*(8), 727-746.

Korkeamäki, E., & Suhonen, J. (2002). Distribution and habitat specialization of species affect local extinction in dragonfly Odonata populations. *Ecography, 25*(4), 459-465.

Kraft, N. J., Valencia, R., & Ackerly, D. D. (2008). Functional traits and niche-based tree community assembly in an Amazonian forest. *Science, 322*(5901), 580-582.

Lack, D. (1954). *The Natural regulation of Animal Numbers*. The Clarendon Press, Oxford.1-87.

Lysyk, T. (1993). Seasonal abundance of stable flies and house flies (Diptera: Muscidae) in dairies in Alberta, Canada. *Journal of Medical Entomology, 30*(5), 888-895.

Mahon, C.L., Martin, K., & Steventon, J. (2007). Habitat attributes and chestnut-backed chickadee nest site selection in uncut and partial-cut forests. *Canadian Journal of Forest Research, 37*(7), 1272-1285.

Martin, K., Aitken, K.E., & Wiebe, K.L. (2004). Nest sites and nest webs for cavity-nesting communities in interior British Columbia, Canada: nest characteristics and niche partitioning. *The condor, 106*(1), 5-19.

Martin, T.E. (1995). Avian life history evolution in relation to nest sites, nest predation, and food. *Ecological monographs, 65*(1), 101-127.

McCain, C.M. (2009). Global analysis of bird elevational diversity. *Global Ecology and Biogeography, 18*(3), 346-360.

Mengesha, G., & Bekele, A. (2008). Diversity and Relative Abundance of Birds of Alatish National Park, North Gondar, Ethiopia. *International Journal of Ecology and Environmental Sciences, 34*(2), 215-222.

Mullens, B.A., & Meyer, J.A. (1987). Seasonal abundance of stable flies (Diptera: Muscidae) on California dairies. *Journal of Economic Entomology, 80*(5), 1039-1043.

Munday, P.L. (2004). Habitat loss, resource specialization, and extinction on coral reefs. *Global Change Biology*, *10*(10), 1642-1647.

Newton, I. (1998). *Population limitation in birds*: Academic press, UK,1-597.

Paton, P., Griffin, C., & Griffin, L. (1982). Rose-ringed parakeet nesting in Hawaii: A potential agricultural threat. *Elepaio*, *43*(5), 37-39.

Politi, N., Hunter Jr, M., & Rivera, L. (2009). Nest Selection by Cavity-nesting Birds in Subtropical Montane Forests of the Andes: Implications for Sustainable Forest Management. *Biotropica*, *41*(3), 354-360.

Roberts, T. J. (1991). *The Birds of Pakistan. Vol. 1, Regional Studies and Non-Passeriformes*, Oxford University Press.

Robles, H., & Ciudad, C. (2012). Influence of Habitat Quality, Population Size, Patch Size, and Connectivity on Patch-Occupancy Dynamics of the Middle Spotted Woodpecker. *Conservation Biology*, *26*(2), 284-293.

Schooley, R.L., & Branch, L.C. (2009). Enhancing the area–isolation paradigm: habitat heterogeneity and metapopulation dynamics of a rare wetland mammal. *Ecological Applications*, *19*(7), 1708-1722.

Schooley, R.L., & Branch, L.C. (2011). Habitat quality of source patches and connectivity in fragmented landscapes. *Biodiversity and Conservation*, *20*(8), 1611-1623.

Shafi, M., Khan, A., & Hussain, I. (1986). Parakeet damage to citrus fruit in Punjab. *Journal of Bombay Natural History Society*, *83*, 439-444.

Slobodchikoff, C. (1984). Resources and the evolution of social behavior. *A New Ecology*, 227-251.

Thomas, C. (1994). Extinction, colonization, and metapopulations: environmental tracking by rare species. *Conservation Biology*, *8*(2), 373-378.

Von Haartman, L. (1957). Adaptation in hole-nesting birds. *Evolution*, *11*(3), 339-347.

Warren, M., Hill, J., Thomas, J., Asher, J., Fox, R., Huntley, B., Harding, P. (2001). Rapid responses of British butterflies to opposing forces of climate and habitat change. *Nature*, *414*(6859), 65.