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Variation in birdsong of red vented bulbul (*Pycnonotus cafer)* Inhabiting two different locations

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Abstract
This species emits a high variety of acoustic signals in their communication. The signals may be long or short and simple; these signals can be classified into songs and calls. Individuals sang throughout the year. The songs of red-vented bulbul (*pycnonotus cafer*) in two regions: Gulbarga and Ainoli were studied during the period from March 2008 to June 2009. The results show that variations exist in this bird species. The songs of birds from two regions shows differences in the tone characteristics, number of syllables, duration, spectral features and frequency range of the main sentence and so on.

Keywords: *Pycnonotus cafer,* Gulbarga, Ainoli.

INTRODUCTION

The vocalizations of animals are unique in that they lend themselves readily to accurate and objective analysis, made possible through the recently improved technical aids in sound recording and analysis. Birds use an array of vocal signals in their communication. These signals may be long and complex or short and simple, and they may occur in particular contexts (Catchpole and Slater 1995). On the basis of physical characteristics and functional context, vocal signal may be classified into calls and songs. However, songs and calls are not always easy to distinguish (Borowiec and Lontkowski 2000, kumar 2003). Vocalizations uttered in single articulation and generally made up of single element (an element preceded and followed by a single gap) are known as calls, where as typical song may include a continuous series of strophes/ phrases (Catchople and slater 1995, Geoff 1996, Bhatt *et al.,* 2000).

Generally, male bird use songs for territorial broadcast and more attraction (Bhatt *et al.,* 2000). In some cases, birds use songs for other purposes, such as to coordinate nest exchange between mates (Smith 1998), inform females that there is no immediate threat of predation (Johnson and Kermott 1991). In some bird species females also sing (Ritchison 1983) such as in the superb Fairy wren *Malurus cyaneus* (Cooney and Cockburn 1995) and Magpie-Robin *Copsychus saularis* (Kumar and Bhatt 2002). Bird song may sometimes occurs outside the breeding season (Kelsey 1989).

Bird vocalizations are significantly variable within an individual to between species on regional, local basis. Geographical Variation in songs is common and taxonomically widespread among birds and can be distinguished into two forms; macrogeographic and microgeographic (Mundinger 1982). Macrogeographic variation refers to differences that are found between populations, individuals from which are unlikely to meet each other. Significant macrogeographic differences between populations have been demonstrated in several species, such as Lincoln's Sparrows (*Melospiza lincolnii*) (Cicero and Benowitz-Fredericks 2000), Song sparrows (*M. melodia*) (Peters *et al.,* 2000), Willow Flycatchers (*Empidonax trailli*) (Sedgwick 2001), Golden Bowebirds (*Prionodura newtonia*) (Westcoott and Kroon 2002). In contrasts, microgeographic variation refers to song variations at a local between neighboring birds that interact with each other within a population (Mundinger 1982, nelson 1998). A dialect pattern is a particular form of microgeographic variation characterized by discrete boundaries between song forms (Mundinger 1982). Many models concerning the evolution of dialects patterns have been proposed, and describing microgeographic variation in song is fundamental to the direct of those models (Catchpole and Slater 1995).

The Red-vented bulbul *Pycnonotus cafer* is a tropical songbird, widely distributed throughout the Indian sub-continent, and common in gardens and light scrub jungle. It is a non-territorial species living in pairs to large flocks (Ali 1996, Grimmett *et al.,* 1998). Although several aspects of its behavior and ecology have been well studied (Vijayan 1978), little is known about vocalizations (Kumar and Bhatt 2000).

Therefore the present study was undertaken to record and analyse song of red-vented bulbul inhabiting two locations of north Karnataka; Gulbarga and Ainoli, which are located 85 kms apart. This, it was hoped, would provide an opportunity to work into feature of the bird-song and the location-specific characteristic features if any. Red-vented bulbul was used as it is a resident bird and delivers song throughout the year.

MATERIALS AND METHODS

Red-vented Bulbul *Pycnonotus cafer* is the largest genus in the bulbul family Pycnonotidae represented by having 36 species (Myers *et l.,* 2008). Red-vented bulbul *Pycnonotus cafer* is widely distributed throughout the Indian sub-continent. It is perky smoky-brown avian species with a partially crested black head, scale-like markings on breast and black, a conspicuous crimson patch below the root of the tail and white rump, the last particularly noticeable in

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flight. It is a resident species, inhabitant of gardens and light scrub forest, both near and away from human habitation. It is an arboreal, non-territorial (individuals do not defend territories), sexually alike species, lives in pairs to large flocks (Vijayan 1978; Ali and Ripley 1983).

The present study was carried out in two regions from March 2008 to June 2009. The study area Gulbarga lies between 17 04' -77 42' longitude and 16 12' -17 46' latitude and placed 45meters above the mean sea level area. Gulbarga possesses a typical climate of south Indian peninsula with semi-arid conditions, with temperature between 14- 45º C and the average rainfall being 702 mm. This area falls under the 'maiden zone as described by (David *et al.,* 1974) and typically has an undulating countour, thus making scope for depression and catchment area. The forest area of the District is 267.720 sq. miles, occupying the 4% of the geographical area. The forests are mainly deciduous at north eastern zone, with fairly dense tree growth.

Ainoli village which is just 5km from Chincholi taluk (80 km distance from Gulbarga district which lies between 77 25' 48' E latitude of 17 28' 12' N) which itself represents 50% of the forest and possess teak, rosewood trees.

Approximately songs of twenty males from each (two) regions were recorded, Ainoli is located 85km distance from Gulbarga city (Figure 1). All the sites were within 100km. From each locality, songs of males were recorded once or twice every month, between early morning and late evening. For photographs a SONY DH7 handycam camera with 15× optical zoom lens (8.1mp) used.

Songs of males were recorded in the field using SONY ICD-U50 (IC recorder). Recording was made in disturbed suburban, rural areas where this species is well adapted and commonly found. Recordings of individual's songs were recorded until either it stopped singing or flew out of recording range. After each individual was recorded, location was noted. Because birds were not individually marked, songs recorded from different locations were considered to represent different samples analyzing microgeographic pattern of songs. In case where we recorded songs at same locations on more than one the spectrograms were identical, those songs were classified as belonging to the same bird. All songs recorded from the same location were considered a single bird sample except for songs from counter-singing individuals at the same location which could be distinguished and therefore, considered to belong to different bird samples.

Recording were digitized and analyzed using (Raven pro 1.4 beta version standard permanent license software, The Cornell Lab of Ornithology), with a sampling rate of 22.5 to 48 kHz, and 16-bit resolution, and FFT (Fast Fourier Transform)- length of 512 points.

In the present study, minimum frequency, maximum frequency and duration of song were measured. Results were expressed as mean ±SE.

RESULTS

In total, six hundred and forty songs were obtained from twenty males from each region. For statistic six readings were taken from each region (Table 1). A 2-5 min recording was analyzed per individuals. (Figure 2, A. B) shows the song phrase of two regions, these phrases consists of three to four elements. The last element is represented by addition element in Anioli (Figure 2B) region, which shows variation from that of Gulbarga region (Figure 2 B).

Minimum frequency was higher in Gulbarga (1433.2 ±0.77) region when compared to Ainoli (1273.5±0.77) with significant difference (Mann-Witney test) (P< 0.01). Maximum frequency of Ainoli (3274.7±0.70) was higher when compared to Gulbarga with (2983.5±0.77) which is also significant (Mann-Witney test). Similarly song duration, length of song duration of Ainoli is more due to extra element (0.725±0.007) when compared to Gulbarga (0.685±0.007) the difference song duration was also significant (Mann-Witney test).

Table 1. Song characteristics of red-vented bulbul *pycnonotus cafer* in the two regions; Gulbarga and Ainoli.

REGIONS	GULBARGA	AINOLI
Individuals (N)	6	6
Minimum frequency (kHz)	1433.2 ±0.77	1273.5±0.77 **
Maximum frequency (kHz)	2983.5±0.77	3274.7±0.70 **
Song Duration (sec)	0.685±0.007	0.725±0.007 *

N- Number of individuals; Mean± standard error *P< 0.05; **P< 0.01

Fig 1. Map showing locations where red-vented bulbul (*pycnonotus cafer)* were recorded. A)Gulbarga B)Ainoli

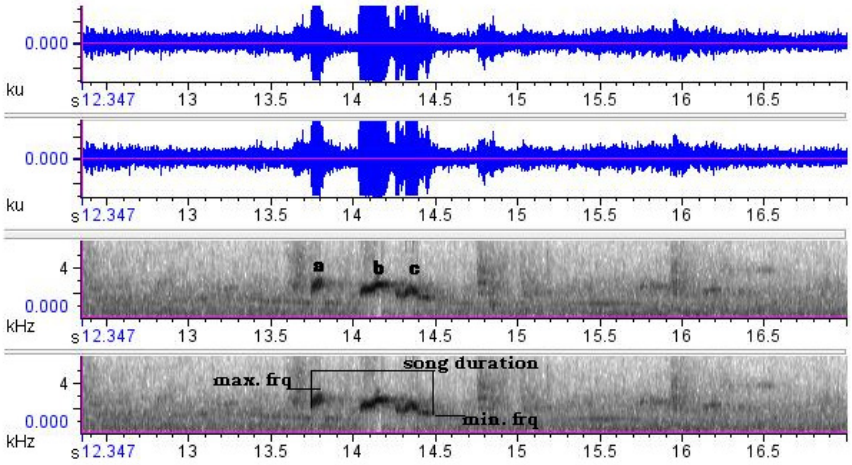

Fig 2 A. A sonogram of red-vented bulbul of Gulbarga region, illustrating the terminology used in describing different parts of song.
a, b, c- three elements
Min. freq, Max. freq, song duration.

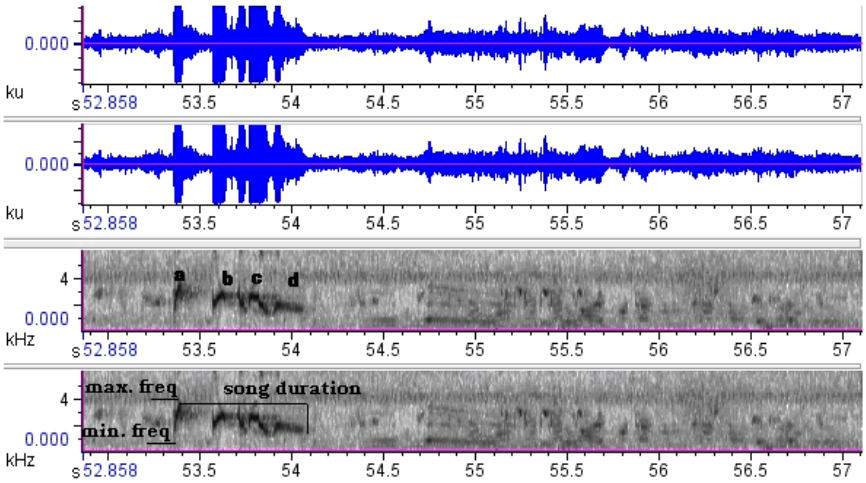

Fig 2B. A sonogram of red-vented bulbul Ainoli region, illustrating the terminology used in describing different parts of song.
a, b, c, d- four elements
Min. freq, Max. freq, song duration

DISCUSSION

The Red-vented bulbul *pyconotus cafer* is a suitable model to study communication systems of birds in India because it is commonly available species. The birds are often familiar with humans and allow close recordings. Some bird species can recognize the vocalization of their mates (Lambrechts and Dhonft 1995), and each individual song repertoire may consist of a unique combination that may be individually distinctive (McGregor and Krebs 1982, Weary *et al.,* 1990). Twenty-one species of Red-vented bulbul (Pycnonotidae) exist in the Indian sub-continent (Grimmett *et al*., 1998), with some being endemic and/ or rare. Comparison of sonogram obtained from two regions of Gulbarga and Ainoli revealed both similarities and differences among population in song phrase. The specific frequency of the song and the pattern at the beginning of each element 'introductory note' can be considered as species recognition. Several studies have shown that geographical divisions influences on the song syntax in each population and causes the difference in territorial songs (Glaubercht, 1989; Martens and Meincke, 1989; Helb and Dieter, 1994; Jesse, 1994; Martens et al., 1994; and Steil, 1997).

Geographical variation has been demonstrated in the songs of many species (Benson, 1948; Borror, 1961) and in a few cases there is evidence that the variation is manifest as a series of local song 'dialects' In European Chaffinch (*Fringilla coelebs*) one of the best studied examples (Promptoff, 1930; Poulsen, 1951; Marler, 1952; Thorpe, 1958). (Marler and Tamura 1964) used the variation in the pattern of introductory whistle, the fine structure of the trill in the strophe to identify the pattern of dialect of white-crowned sparrow, *Zonotrichia leucaphrys.* Alternatively, (Marten and Steil 1997) used the number and character of elements and song syntax to identify the song dialect of lesser whitethroat, *Sylvia curruca.*

The present study which is "perhaps first for an Indian bird species", suggested that there were significant difference between two populations and the occurrence of variations in two populations of the red-vented bulbul *pycnonotus cafer* is evident. The dissimilarity is a result of alteration and variation in some elements, specifically the last elements. Although males use the similar first element (introductory note) for species recognition among their population, the last elements in the song phrase in two population

shows variation within the same species (Figure 2, A. B). Variation in the elements determine the degree of song differences in each population for communication between males and their neighbors in each population area, particularly in territorial advertisement and pairing mating (Beme, 1994; Bigot *et al*., 1994; Fujita, 1994). The unique pattern of song can be transferred from adults to younger generation. It is believed that passerine bird has ability to learn and evolve its own distinctive array of songs that have evolved within certain species, becoming the significant trend of song dialect that exists within them (Catchphole, 1979; Packert *et al*., 2001). "The results clearly show location-specific difference in the characteristic feature of the birdsong. The transmission of the song pattern to the offspring seems to be "cultural". "It is probable that adopting the location specific-song has survival value. However, further studies involving experimental isolation of the species will be required to understand the mechanisms involued.

Raven software (Cornell lab of ornithology) for birdsong analysis (sonogram) in recent research helps to study rare and endangered species, which is an important technique used by HBOC (Hunter bird observation) field studies team.

REFERENCES

[1] Ali, S. and S. D. Ripley 1983. Hand Book of The Birds of India and Pakistan. Oxford University Press, Delhi, xiii+737 pp.

[2] Ali S. 1996. The book of Indian birds. Mumbai: Oxford University Press.

[3] Benson, C. W. 1948. Geographical voice- variation. Ibis, 90: 48-71.

[4] Beme, I. R. 1994. Formation of acoustic repertorie in the Turdidae. *Journal fur Ornithology,* 135: 314.

[5] Bhatt D, Kumar A, Singh Y and Payne RB. 2000. Territorial songs and calls in Oriental Magpie- Robin *Copsychus saularis. Curr Sci* 78: 722- 728.

[6] Bigot, E., Hausberger, M. and Clergeau, P. 1994. Dialects and social organization within roosts in starlings. *Journal fur Ornithology*, 135: 316.

[7] Borowiec M and LOntkowski J. 2000. Sexual selection and the evolution of songs in birds of the genus *Acrocephalus. Bio Bull Ponzan* 37: 69- 77.

[8] Borror, D. 1961. Intraspecific variation in passerine bird songs. *Wilson Bull.,* 73: 57-78.

[9] Catchpole, C. K. 1979. Vocal Communication in Birds. London: Edward Arnold.

[10] Catchople, C. K. 1979. Vocal communication in birds, London.

[11] Catchpole CK and Slater PJB. 1995. Bird song: Biological themes and variations. Cambridge: Cambridge University Press.

[12] Cicero CC, ZM Benowitz-Federicks. 2000. Song types and variation in insular populations of Lincoln's Sparrow (*Melospiza lincolnii*), and comparisons with other *Melospiza.* Auk 117: 52-64.

[13] Cooney R and Cockburn A. 1995. Territorial defense is the major function of female song in the Superb Fairy- Wren (*Malurus cyaneus)*. *Animal Behaviour* 49: 1635- 1647.

[14] Fujita, K. 1994. The function of song in varied tits. Who maintain a strong pairbond. *Journal fur Ornithology.* 135: 319.

[15] Geoff S. 1996. Bird songs and calls of Britain and Northern Europe. London: Harper Collians Publ

[16] Glaubercht, M. 1989. Microgeographical variation songs of yellowhammer (*Emberiza citronella*) at the dialect in the northern *Germany Journal fur Ornithology,* 135: 321.

[17] Grimmett R, Inskipp C and Inskipp T. 1998. Birds of Indian subcontinent. London: Oxford University Press.

[18] Hausberger, M. and Henry, L. 1994. Social influences on song learning in male and female European starlings. *Journal fur Ornithology,* 135: 161.

[19] Helb, H. W. and Diieter, W. 1994. Geographic variation of song structure in the scarlet grosbeck. *Journal fur Ornithology,* 135: 321.

[20] Jesse, A. 1994. Song dialects and origin of insular populations of white crowned sparrows. *Journal fur Ornithology,* 135: 324.

[21] Johnson LS and Kermott LH 1991. The functions of song in male wrens. (*Troglodytes aedon). Behaviour* 116: 190- 206.

[22] Kelsey MG. 1989. A comparison of the song and territorial behavior of a long- distance migrant, the Marsh Warbler *Acrocephalus palustris* in summer and winter. Ibis 131: 403- 414.

[23] Krebs, J. R., and D. E. Kroodsma. 1980. Repertories and geographical variation in bird song. *Adv. Study Behav*. 11: 143-177.

[24] Kroodsma, D. E., and E. H. Miller, eds. 1982. Acoustic communication in Birds, 2 volumes. New York: Academic Press.

[25] Kumar A and Bhatt D. 2000. Vocal signals in a tropical avian species the Red- vented Bulbul *Pycnonotus cafer*: Their Characteristics and importance. *J Biosci* 25: 387- 396.

[26] Kumar A and Bhatt D. 2002. Characteristics and significance of song in female Oriental Magpie Robin *Copsychus saularis. J Bombay Nat His Soc* 99: 54- 58.

[27] Kumar, A. (2003). Acoustic communication: difference in songs and calls, their production and biological significance.*Resonance* 8(6): 44-55.

[28] Marler, P. 1952. Variation in the song of the Chaffinch, *Frinfilla coelebs.* Ibis, 94: 458-472.

[29] Marler, P., and M. Tamura. 1962. Song dialects in three populations of the white- crowned sparrow. Condor 64: 368- 377.

[30] Marler, P. and Tamura, M. 1964. Song "dialects" in three populations of white- crowned sparrows. Science, 146, 1483- 06.

[31] Martens, J., and Meincke, C. 1989. Territorial song of the Siberian chiffchaff (*Phyloscopus collybita tristis*) and playback experiments within a central European population (*Ph. C. tristis*) *Journal fur Ornithology,* 130: 455-473.

[32] Martens, J., Petri, B. and Nazarenko, A. A. 1994. Great Tit vocalizations in the Amus hybrid zone. *Journal fur Ornithology*, 135: 331.

[33] Martens, J. and Steil, B. 1997. Territorial song and species differentiation in the whitethroat superspecies *Sylvia curruca*. *Journal fur Ornithology*, 138: 1-23.

[34] McGergor, P. K. Krebs, J. R. 1982. Songs types in a population

of great tit (*parus major*): their distribution, abundance and acquisition by individuals. *Behaviour,* 79, 126-52

[35] Mello CV, Ribeiro S. 1998. ZENK protein regulation by song in the brain of songbirds. J Comp Neurol 393: 426- 38.

[36] Mundinger PC. 1982. Microgeographic and macrogeographic variation in the acquired vocalizations of birds. *In* DE Kroodsma, EH Miller, eds. Acoustic communication in birds. New York: Academic Press, pp. 147-208.

[37] Myers, P., R. Espinosa, C. S. Parr, T. Jones, G.S. Hammond and T. A Dewey 2008. The animal diversity web (online). Accessed February 02, 2012 at http://animaldiversity.org

[38] Peters S, WA Searcy, MD Beecher, S Nowicki. 2000. Geographic variation in the organization of Song Sparrow repertories. Auk 117:839-942.

[39] Nelson DA. 1998. Geographic variation in song of Gambel's Whitw-crowned Sparrow. *Behaviour* 135: 321-342.

[40] Nottebohm, 1987. Seasonal changes in gonadal hormone levels of adult male canaries and their relation to song. *Behav. Neural Biol.*, 47, 197- 211.

[41] Poulsen, H. 1951. Inheritance and learning in the song of the Chaffinch (*Fringilla coelebs* L.). *Behaviour*, 3: 216-228.

[42] Promptoff, A. N. 1930. Die geographische Variabilitat dea Buchfinkenschlags (*Frindilla coelebs* L.) in Zusammenhangh mit etlichen allgemeinen Fragen der Saisonvgeluge. *Biol. Zentralbl.,* 50: 478-503.

[43] Ritchison G 1983 The function of singing in female black- headed grosbeaks (*Pheucticus melanocephalus)*: Family- group maintenance: Auk 100 105- 116.

[44] Sedgwick JA. 2001. Geographic variation in the song of Willow Flycathers: differentiation between *Empidpnax traillii adastus* and *E. t. extinus*. *Auk* 118: 366-379.

[45] Smith, W. J. 1988. Patterned daytime singing of the eastern wood- pewee (*Contopus virens). Animal Behaviour.* 36: 1111-1123.

[46] Spector, D. A. 1992. Wood- warbler song systems: a review of paruline singing behaviors. *Current Ornithology* 9:199-238.

[47] Steil, B 1997. Territorial song and species differentiation in the lesser whitethroat superspecies *Sylvia currca. Journal fur Ornithology,* 138: 1-23.

[48] Thieclcke, G. 1992. Stability or changes in dialects and dialect borders of the short- toed tree creeper (*Certhia branchdactyla)*. *Journal fur Ornithology,* 133: 44- 58.

[49] Thompson, A. D., and M. C. Baker. 1993. Song dialect recognition by male White- crowned Sparrows: effects of manipulated song components. *Condor* 95: 414- 421.

[50] Thorpe, W. H. 1958. The learning of song patterns by birds, with special reference to the song of the Chaffinch *Fringilla coelebs.* Ibis, 100: 535-570.

[51] Trainer, J M. 1983. Changes in song dialect distributions and microgeographic variation in song of White- crowned Sparrows (*Zonotrichia leucophrys nuttali). Auk* 100: 190- 214.

[52] Vijayan VS. 1978. Breeding biology of bulbuls *Pycnonotus cafer and Pycnonotus luteolus* (Class: Aves, Family: Pycnonotidae) with special reference to their ecological isolation. *J Bombay Nat Hist Soc* 75: 1090- 1117.

[53] Wanker, R., Apcin, J. and Jennerjahn, B. 1998. Descrimination of different socialcompanion in spectacled parrotlets (*Forpus conspicillatus)*: Evidence for individual vocal recognition. *Journal of Behavioral Ecology and Sociobiology, 43*: 197- 202.

[54] Westcott DA, FJ Kroon. 2002. Geographic song variation and its consequence in the Golden Bowerbird. *Condor* 104: 750-760.