

Spectral analysis of sounds of *Saxicoloides fulicata* (Indian robin)

M. Rajashekhar*, K Vijaykumar

Department of Zoology, Gulbarga Univeristy, Kalaburagi-585106

E-mail address: *m_rajshekhar@rediffmail.com (Author for corresponding)

Keywords: Indian robin, sounds of bird, spectral analysis, Introduction

ABSTRACT. The present study focused on recordings of sounds of *Saxicoloides fulicata* (Indian robin) from Kalaburagi district, Karnataka state. The study was undertaken during the Many 2012 to April 2013. During the study period about 50 samples of sounds of Indian robin were recorded and spectral analysis was performed subjected to sound samples. the study results indicate that, three types of sounds were identified and with significant variations in their structural hierarchy with distinct high and low frequencies.

1. INTRODUCTION

The primary sound source in birds is syrinx, which is a unique organ to birds (King 1989). Syrinx is located at the junction of the two primary bronchi and the trachea or entirely in the trachea or in the bronchi. Syrinx resembles human vocal cords in function, but it is very different in form. Also the vocal tract, whose main parts are trachea, larynx, mouth and beak, interacts to the sound of birds (Nowicki 1987).

Mundinger (1982) has studied variations in bird songs in different locations. There are several factors has influence on sounds of the birds, which includes, type of environment, in which birds are residing and genetic makeup (Kroodsma and Canady 1985, and Morton 1975). According behavioral studies, the early sate of life influce on variations and type of sounds produced by birds (Nelson and Marler 1994 and MacDougall-Shackleton 2001). The typical characteristic of bird sound is useful for identification of particular species and it can be served as isolation of species (Payne 1986).

Earlier studies on sounds of various birds from different localities state that, sounds of birds (calls/songs) has hierarchical structure: these species specific sounds are composed of different elements, similar elements are called syllables, similar syllables are called as phrases (Catchpole and Slater 1995).

Analyzing sounds hierarchy may provide the detailed information regarding the specification of sounds. In this directions some of the Indian workers are studied sounds of various birds in detailed. (Vijayan 1978, Kumar and Bhatt 2000).

Therefore the present study was undertaken to record and analyse sounds of Indian robin inhabiting of Gulbarga district, Karnataka state.

2. MATERIALS AND METHODS

The Indian Robin (*Saxicoloides fulicata*), is a small passerine bird that was formerly classed as a member of the thrush family Turdidae, but is now more generally considered to be an Old World flycatcher, family Muscicapidae. and similar small species are often called chats.

The Indian Robin is an insectivorous species which is a resident breeder in Pakistan, India and Sri Lanka. It is found in scrub jungle and other open habitats including around habitation. It nests in a hole in a wall, tree-stump or bank, laying 2-3 creamy white eggs on a pad of grass lined with feathers or hair. Only the female incubates the eggs.

This species is 19cm long, including the long cocked tail. It is similar in shape to the smaller European Robin, but is longer-tailed.

The study area Kalaburagi is located between 17° 04' -77° 42' longitudes and 16v 12' -17° 46' latitude. Kalaburagi has district climatic conditions with temperature between 15 °C to 44 °C.

In the present investigation the sounds of Indian robin were recorded in Kalaburagi district during May 2012 to April 2013. During the study period about sounds of 55 species were recorded by using Sony ICD-UX533F 4 GB sound recorders. These recordings were digitized using M-Audiophile 2496 (sound card) at a sampling rate of 22.5 to 48 kHz and 16-bit resolution between early morning and late evening.

After digitized, the fragments of high quality recordings were analyzed with the help of Revan Lite 1.0 soft-ware. All spectrograms were produced with the following settings: 512 FFT-length, 75% Frame, Hamming window and 87.5% time window overlap. In the present study, minimum frequency, maximum frequency, range of frequency, dominant frequency (frequency of maximal amplitude), duration and gap in signals were measured to define the acoustical features of the vocalizations. Number and types of elements were also measured.

3. RESULTS AND DISCUSSION

The sounds of Indian Robin was tested by using Lite 1.0 software and classified as three different types of sounds and given name as Type I, Type II, and Type III respectively.

In the present investigation all the three types of sounds of Indian Robin was divided in two three categories namely elements, syllable, phrase respectively.

In the type I sound consist of seven elements (**a, b, c, d, e, f, g**), two syllables and two phrase respectively. the element '**a**' is originated between 3.624 KHz to 6.188 KHz and the time duration is 0.17 sec, the element '**b**' was existed between 3.268 to 6.811 KHz, the duration of time is 0.05 sec, similarly the element '**c**' originated between 6.616 KHz to 6.668 KHz and the time duration of element is 0.098 sec, whereas the element '**d**' was originated between 2.680 KHz to 6.668 KHz and the duration of time is 0.058 sec repetitively.

Similarly the **e** element existed between 3.416 KHz to 7.646 KHz, the duration or element is 0.124, while the element **f** originated between 5.312 KHz to 7.646KHz and the duration of element is 0.132 sec, where as element **g** is originated between 2.913 to 7.434 KHz and the duration of the element is 0.117

The type II sound comprises of three elements (**h, i, j**) and five syllable and one phrase has been identified. The element '**h**' was originated between 2.128 KHz to 5.087 KHz, the time duration was 0.284 sec. The element '**i**' was observed between 2.238 KHz to 4.914 KHz and the time duration was 0.16 sec. Similarly the element '**j**' was noticed between 2.279 KHz to 4.915 KHz and duration of time was 0.156 sec respectively.

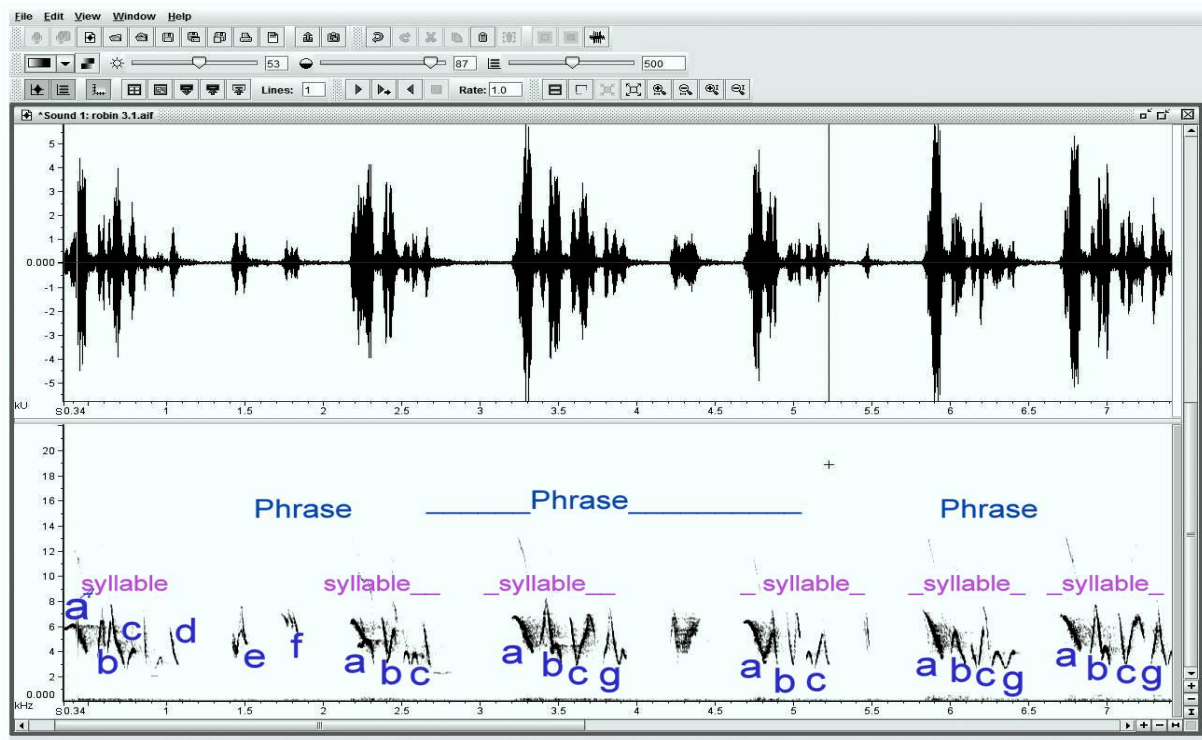


Fig. 1. (Type –I) Descriptive hierarchy of sounds of Indian robin.

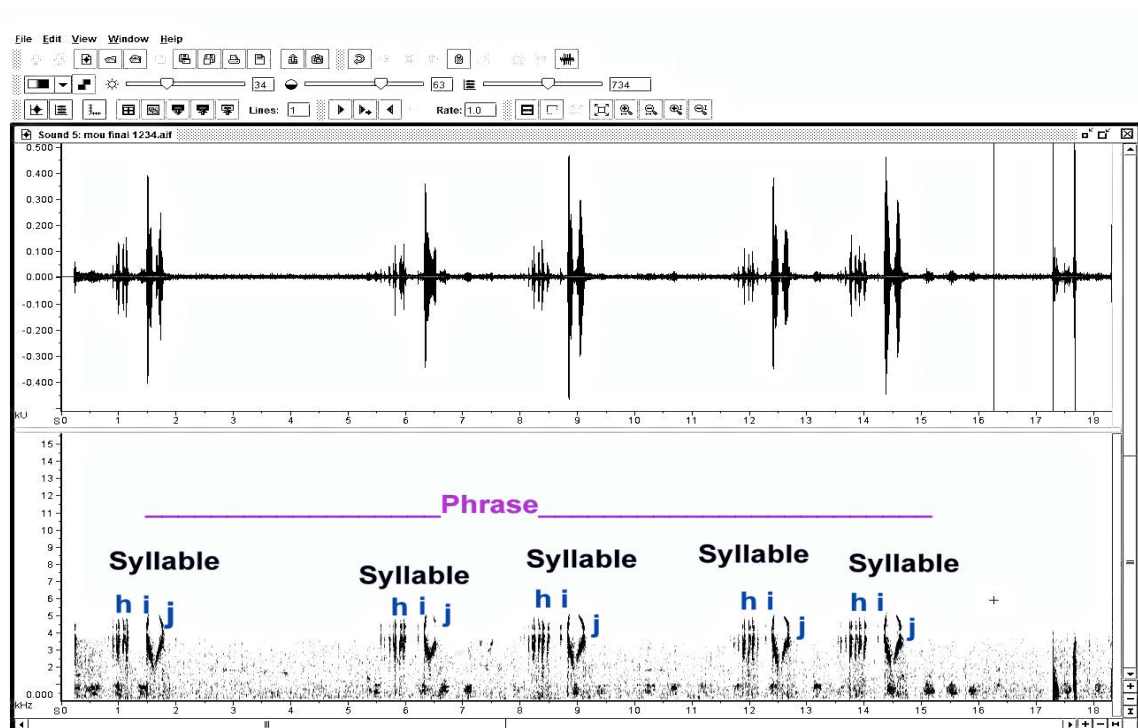


Fig. 2. (Type –II) Descriptive hierarchy of sounds of Indian robin.

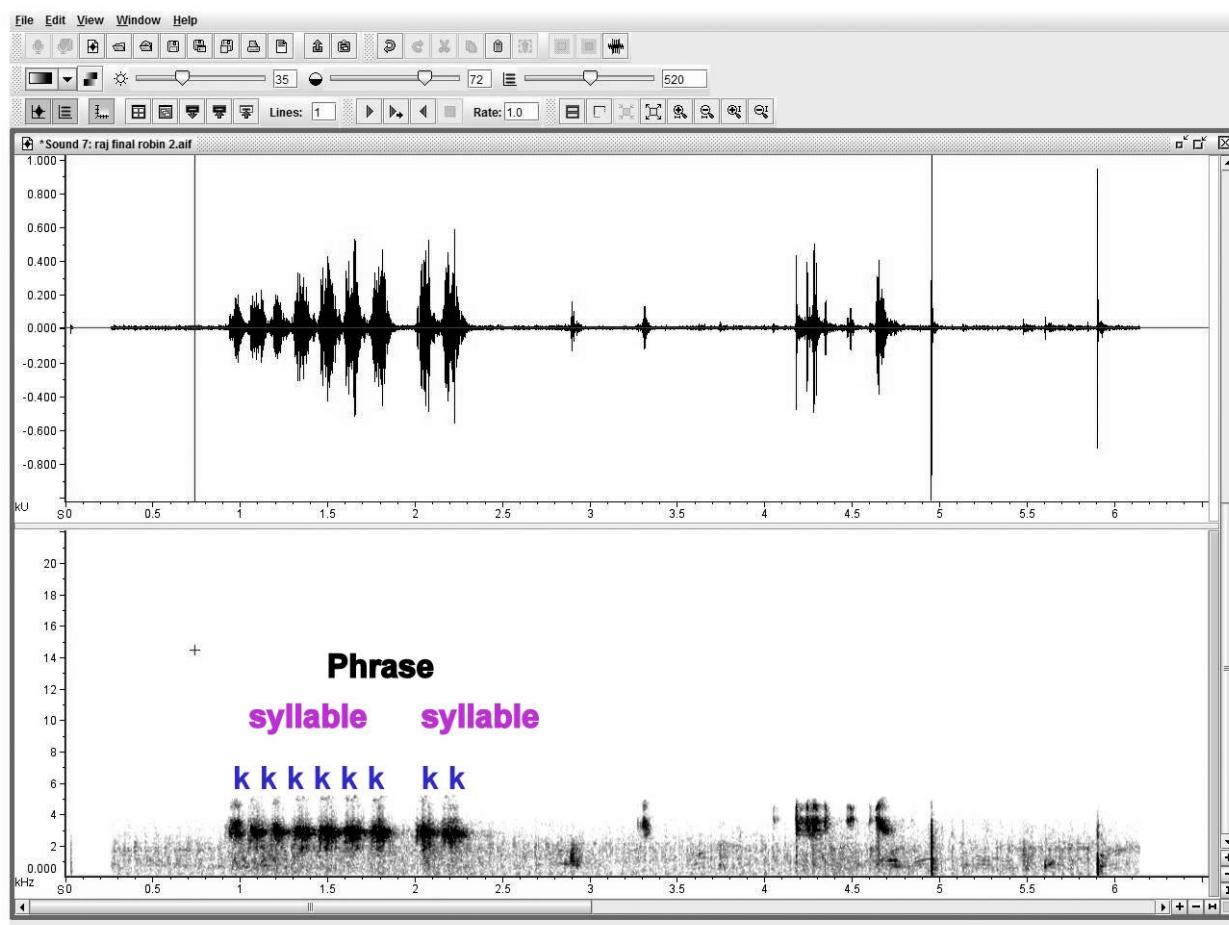


Fig. 3. (Type –III) Descriptive hierarchy of sounds of Indian robin.

The present study results are evident that there were different types of sounds produced by the Indian robin during the study period and there is a significant variation in their sounds. These variations in the sounds will help them to convey the information to other members of the group.

4. CONCLUSIONS

The present study focused on recordings of sounds of *Saxicoloides fulicata* (Indian robin) from Kalaburagi district, Karnataka state. The study was undertaken during the Many 2012 to April 2013. During the study period about 50 samples of sounds of Indian robin were recorded and spectral analysis was performed subjected to sound samples. The study results indicate that, three types of sounds were identified and with significant variations in their structural hierarchy with distinct high and low frequencies.

The sounds of Indian Robin was tested by using Lite 1.0 software and classified as three different types of sounds and given name as Type I, Type II, and Type III respectively.

In the present investigation all the three types of sounds of Indian Robin was divided in two three categories namely elements, syllable, phrase respectively.

In the type I sound consist of seven elements (**a, b, c, d, e, f, g**), two syllables and two phrase respectively. the element '**a**' is originated between 3.624 KHz to 6.188 KHz and the time duration is 0.17 sec, the element '**b**' was existed between 3.268 to 6.811 KHz, the duration of time is 0.05 sec, similarly the element '**c**' originated between 6.616 KHz to 6.668 KHz and the time duration of element is 0.098 sec, whereas the element '**d**' was originated between 2.680 KHz to 6.668 KHz and the duration of time is 0.058 sec repetitively.

Reference

- [1] Catchpole, C. K. and P. J. B. Slater. 1995. Bird song: Biological themes and variations. Cambridge University Press, Cambridge.
- [2] King, A. S. (1989), Functional analysis of the syrinx, in '(King & McLelland 1989)', chapter 3, pp. 105–192.
- [3] Kroodsma DE, RA Canady. 1985. Differences in repertoire size, singing behavior, and associated neuroanatomy among Marsh Wren populations have a genetic basis. *Auk* 102: 439-446.
- [4] Kumar A and Bhatt D: Characteristics and significance of song in female Oriental Magpie Robin *Copsychus saularis*. *J Bombay Nat Hist Soc.* 2002; 99: 54- 58.
- [5] MacDougall-Shackleton, S. A., MacDougall-Shackleton, E. A. & Hahn, T. P. 2001 Physiological and behavioural responses of female mountain white-crowned sparrows to natal- and foreign-dialect songs. *Can. J. Zool.* 79, 325–333.
- [6] Morton ES. 1975. Ecological source of selection on avian sounds. *Am. Nat.* 109: 17-34.
- [7] Mundinger, P. C. 1982 Microgeographic and Macrogeographic variation in the acquired vocalizations of birds. In *Acoustic communication in birds*, vol. I (ed. D. E. Kroodsma, E. H. Miller & H. Quellet), pp. 147–208. New York: Academic Press.
- [8] Nelson DA, P Marler. 1994. Selection-based learning in birdsong development. *Proc. Natl. Acad. Sci. USA* 91:10498-10501.
- [9] Nowicki, S. (1987), 'Vocal tract resonances in oscine bird sound production: Evidence from birdsongs in a helium atmosphere', *Nature* 325(6099), 53–55.
- [10] Payne, RB (2005). *The Cuckoos*. Oxford University Press.
- [11] 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.