



## บทความวิจัย

# รูปแบบ ความถี่ และระยะเวลาของเสียงร้องของนกเขาชวา Pattern, Frequency and Duration of Zebra Dove (*Geopelia striata*) Song

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**Key words :** song pattern, sound frequency, song duration, zebra dove song, *Geopelia striata*, birdsong

### Abstract

The Zebra dove (*Geopelia striata*) is well-known for its songs. This study was to make a preliminary observation on the Zebra dove song patterns from the breeding farms. Fifty adult male Zebra dove song were recorded with tape recorder. Ten songs from each bird were translated into the computerized sound spectrograms. There were variations in song patterns such as number of notes, sound frequencies and song duration. The birds could be grouped into three classes according to the difference in sound frequencies of their songs. Class A was the low-frequency-songbirds, class B was the medium-frequency-songbirds and class C was the high-frequency-songbirds. This classification was in accordance with the local practice which is based solely on listening experience. The Zebra dove song was rather melodious because the three parts, the first part, the middle part and the ending part, had different frequencies. The first part had the highest frequency, and the middle part has the lowest frequency.

### บทคัดย่อ

นกเขาชวา (*Geopelia striata*) เป็นที่รู้จักดีที่เสียงร้อง งานวิจัยนี้เป็นการศึกษาเบื้องต้นเกี่ยวกับรูปแบบของเสียงร้องของนกเขาชวาจากฟาร์มเลี้ยง โดยบันทึกเสียงร้องของนกเพศผู้จำนวน 50 ตัว ซึ่งเสียงร้อง 10 เพลงของนกแต่ละตัวจะถูกแปลงเป็นกราฟด้วยโปรแกรมคอมพิวเตอร์ พบว่ามีความแปรผันในรูปแบบของเสียงร้อง เช่น จำนวนคำ ความถี่ของระดับเสียง และระยะเวลาของเสียงร้อง สามารถแบ่งนกทั้งหมดที่ศึกษาได้ 3 กลุ่มตามระดับความถี่ของเสียง คือ กลุ่ม A มีระดับความถี่ของเสียงต่ำ กลุ่ม B มีระดับความถี่ของเสียงปานกลาง และกลุ่ม C มีระดับความถี่ของเสียงสูง ซึ่งการจัดกลุ่มแบบนี้สอดคล้องกับการจัดกลุ่มของผู้เลี้ยงซึ่งใช้การฟังเสียงร้องเพียงอย่างเดียว เสียงร้องของนกเขานับว่ามีความไพเราะมากเนื่องจากประกอบด้วย 3 ส่วน คือ ส่วนต้น ส่วนกลาง และส่วนปลาย ซึ่งมีระดับความถี่ของเสียงแตกต่างกัน โดยส่วนต้นมีระดับความถี่ของเสียงสูงที่สุด และส่วนกลางมีระดับความถี่ของเสียงต่ำที่สุด

### Introduction

The Zebra dove (*Geopelia striata*) is well-known for its songs. The birds are highly valued for the song quality for dove breeders especially in Southern Thailand, Malaysia and Indonesia. The hobby of keeping Zebra doves as pet birds and the breeding practice are part of the cultural heritage in these countries. However, caring and breeding practice are based on local knowledge which has been passed on for generations, and it is highly varied among different people. To produce good quality bird, there are many problems even among the siblings and from the good pedigree birds. Genetic as well as environmental influences may be important in the development of the songs. The development of scientific basis to assess song quality and to produce birds with good quality songs is, therefore, needed.

This study was to make a preliminary observation on the Zebra dove song patterns from the breeding populations.

### Objective

This study was to conduct a preliminary ob-

servation on the Zebra dove song patterns from the breeding populations

### Materials and methods

The study was conducted at Muang District, Chana District, Na Thawi District, Hat Yai District and Singha Nakhon District of Songkhla, Southern Thailand, from October 2001 until April 2002. The crystallized songs of 50 adult male Zebra doves were recorded with a Sony TCM-23DV tape recorder. Ten songs from each bird were translated into the computerized sound spectrograms. All song spectrograms were then quantitatively examined to find both general and specific patterns, such as number, frequency and duration of notes, duration of rhythm.

### Results

#### Sound frequencies

From 497 song samples of 50 birds, the average sound frequency for the full songs was  $853.47 \pm 85.20$  Hz (min 538.63 Hz - max 1112.25 Hz). The average sound frequencies of 50 birds were significantly difference (One-way ANOVA,

$p = 0.000$ ). Considering the distribution pattern of sound frequencies of all the 50 birds, it might be possible to classify the birds into three classes (Fig.1) : 14 birds of the class A, with the frequencies range from 717.30 Hz -791.31 Hz (average  $755.43 \pm 23.73$  Hz) ; 31 birds of the class B, 810.82 Hz -930.26 Hz (average  $869.76 \pm 37.68$  Hz) ; and 5 birds of class C, 982.47 Hz -1095.00 Hz (average  $1022.51 \pm 44.89$ Hz).The average sound frequencies for the three classes were significantly difference (One-way ANOVA,  $p = 0.000$ ).

The basic format of all songs was similar. The songs were of harmonic type. In a full song, because of note pitch difference, the Zebra dove song always consists of three parts (Fig 2): the first, the middle and the ending part. In all birds,

the first part had only one note (Fig. 3). The same was true for the ending part. The average notes of the middle part was  $2.84 \pm 0.98$  notes (min 1 note - max 5 notes). The middle part of all songs varied significantly (One-way ANOVA,  $p = 0.000$ ), however, the number of notes in the middle part was not significantly difference among song class birds (One-way ANOVA,  $p = 0.09$ ). Class A birds had the average of  $2.50 \pm 0.76$  notes, class B  $2.87 \pm 0.99$  notes and class C  $3.6 \pm 1.14$  notes.

Comparing the sound frequencies of the first, the middle and the ending parts of the full songs from 50 birds, the average frequencies were significantly difference (One-way ANOVA,  $p = 0.000$ ). The average frequency of the first part was  $915.33 \pm 107.47$  Hz (min 741.84 Hz - max 1251.04

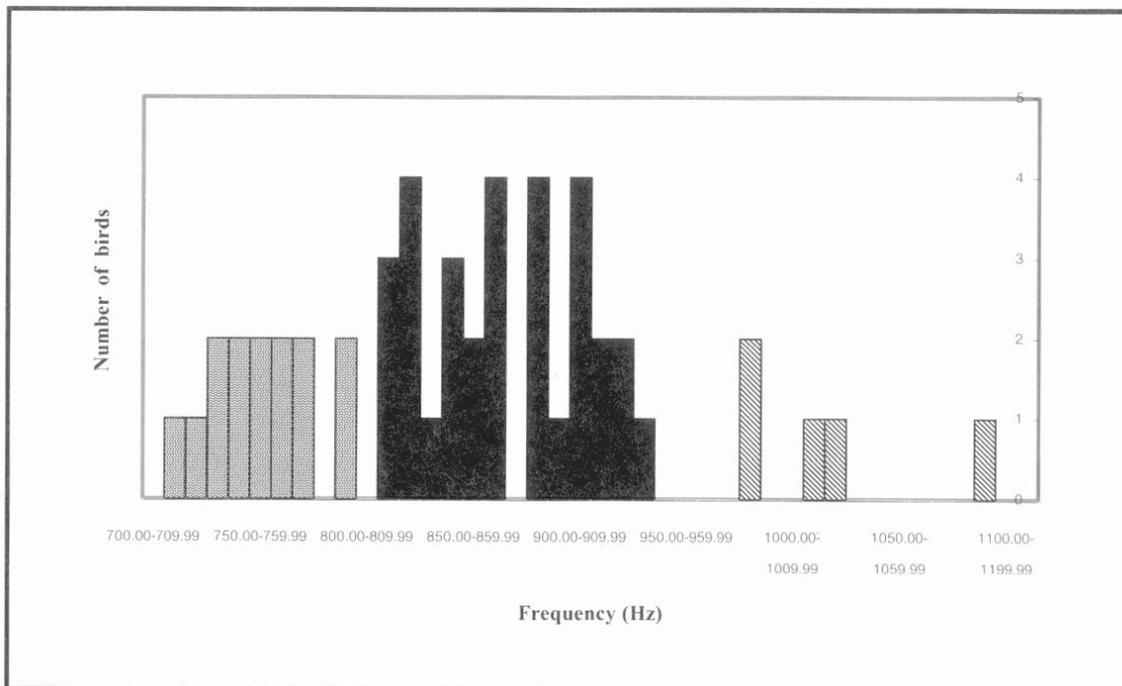


Figure 1 The number of Zebra doves in class A, class B and class C

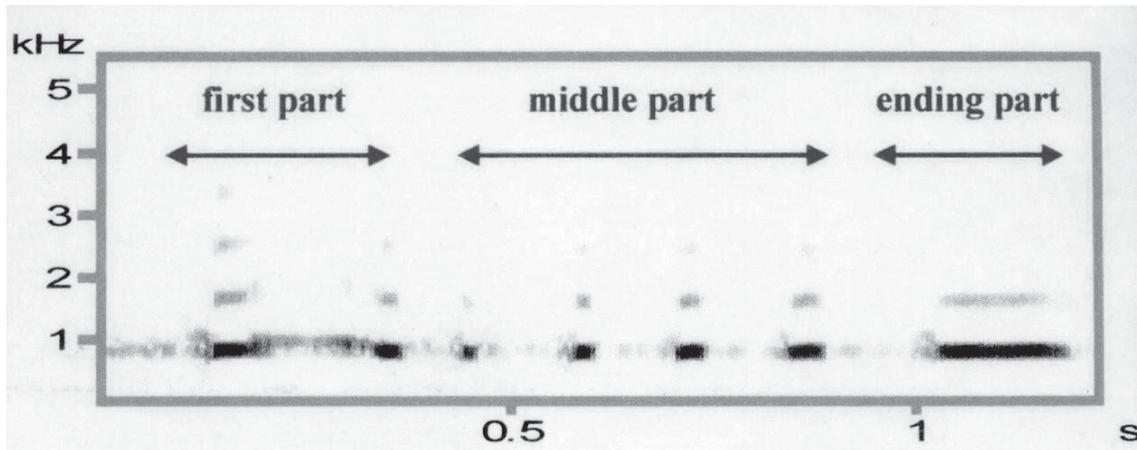


Figure 2 The Zebra dove songs were of harmonic type.

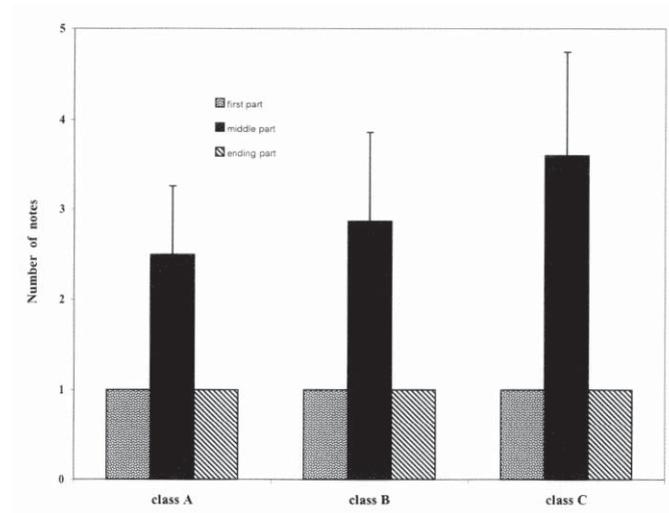


Figure 3 The number of notes in Zebra dove songs. Histograms show means  $\pm$  SE.

Hz), the middle part was  $820.42 \pm 75.86$  Hz (min 699.59 Hz - max 1008.02 Hz), and the ending part was  $823.27 \pm 81.91$  Hz (min 705.61 Hz - max 1030.12 Hz).

Considering each song part separately,

the frequencies of the first song part among 50 birds were significantly different (One-way ANOVA,  $p = 0.000$ ). The same were true for the middle and the ending parts (One-way ANOVA,  $p = 0.000$ ).

Considering each song class separately, the sound frequencies of each parts were significantly difference in class A and class B (One-way ANOVA,  $p = 0.000$ ) but were not significantly difference in class C (One-way ANOVA,  $p = 0.085$ ) (Fig 4). The average frequencies of the first part were  $791.45 \pm 46.82$  Hz,  $945.16 \pm 64.33$  Hz and  $1077.33 \pm 99.58$  Hz for class A, B and C respectively. The average frequencies of the middle part were  $739.74 \pm 20.90$  Hz,  $829.44 \pm 35.16$  Hz,  $990.44 \pm 16.43$  Hz and the ending part were  $734.94 \pm 18.38$  Hz,  $834.70 \pm 41.33$  Hz,  $999.77 \pm 31.91$  Hz.

#### Song duration

The average song duration of the full song was  $0.963 \pm 0.17$  seconds (min 0.544 seconds - max 1.573 seconds). Comparing 50 birds, the average song duration were significantly difference

(One-way ANOVA,  $p = 0.000$ ). Considering each part separately, the average song duration of the first part, the rhythm between the first and the middle part, the middle part, the rhythm between the middle and the ending part and the ending part were significantly difference (One-way ANOVA,  $p = 0.000$ ). The average song duration of the first part was  $0.249 \pm 0.04$  seconds (min 0.174 seconds - max 0.332 seconds), the rhythm between the first and the middle part was  $0.10 \pm 0.05$  seconds (min 0.018 seconds - max 0.202 seconds), the middle part was  $0.30 \pm 0.13$  seconds (min 0.044 seconds - max 0.620 seconds), the rhythm between the middle and the ending part was  $0.103 \pm 0.02$  seconds (min 0.063 seconds - max 0.140 seconds) and the ending part was  $0.217 \pm 0.05$  seconds (min 0.122 seconds - max 0.344 seconds).

Considering each song class separately, the

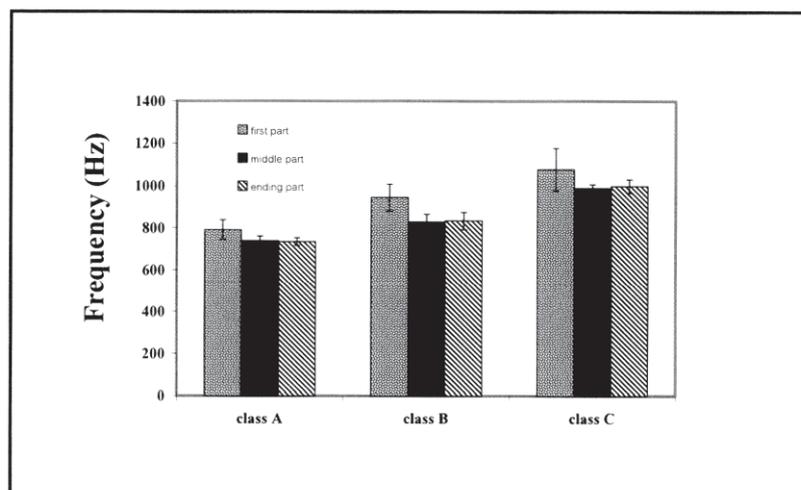


Figure 4 The sound frequency of Zebra dove songs. Histograms show means  $\pm$  SE.

song duration of each part and each rhythm were significantly difference in class A, B and C (One-way ANOVA,  $p = 0.000$ ) (Fig 5). The average song duration of the first part was  $0.259 \pm 0.04$  seconds,  $0.245 \pm 0.04$  seconds and  $0.242 \pm 0.03$  seconds for class A, B and C respectively. The average song duration of the rhythm between the first and the middle part was  $0.119 \pm 0.06$  seconds,  $0.09 \pm 0.04$  seconds and  $0.09 \pm 0.03$  seconds. The average song duration of the middle part was  $0.275 \pm 0.11$  seconds,  $0.307 \pm 0.14$  seconds and  $0.331 \pm 0.09$  seconds. The average song duration of the rhythm between the middle and the ending part was  $0.108 \pm 0.10$  seconds,  $0.103 \pm 0.02$  seconds and  $0.093 \pm 0.02$  seconds. The average song duration of the ending part was

$0.190 \pm 0.10$  seconds,  $0.224 \pm 0.06$  seconds and  $0.174 \pm 0.04$  seconds.

### Conclusions

There were variations in song patterns such as number of notes, sound frequencies and song duration in Zebra doves. The birds could be grouped into three classes according to the difference in sound frequencies of their songs. Class A was the low-frequency-songbirds, class B was the medium-frequency-songbirds and class C was the high-frequency-songbirds. This classification was in accordance with the local practice which is based solely on listening experience.

The Zebra dove song was rather melodious

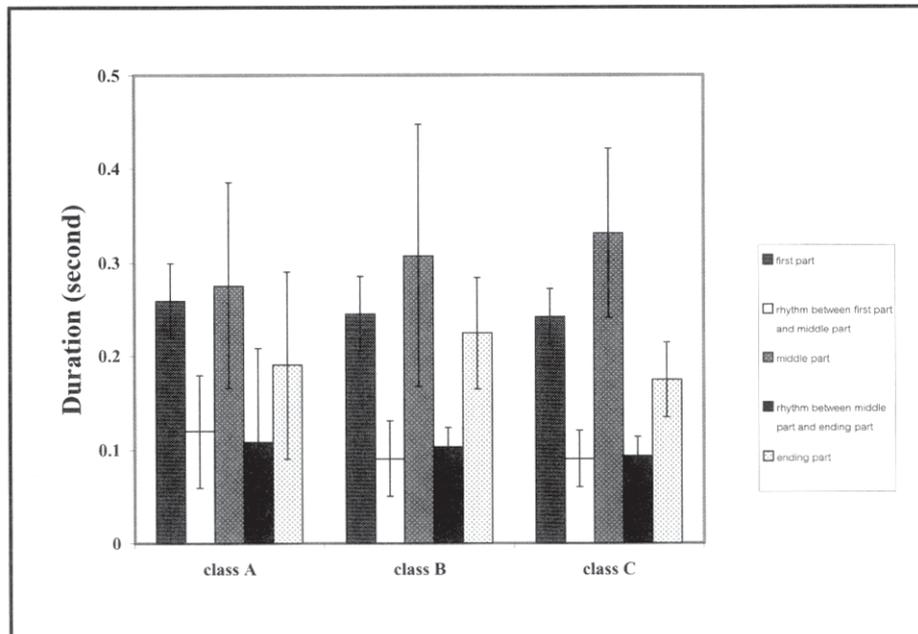


Figure 5 The song duration of Zebra dove songs. Histograms show means  $\pm$  SE.

because the three parts had different frequencies. The first part had the highest frequency, and the middle part has the lowest frequency.

In general, Zebra dove had variation of songs as in some other birds that there were individual song variations in song pattern, sound frequency and song duration in conspecific crystallized birdsong (Welty, 1982; Lind, *et. al.* 1996; Slabbekoorn and Cate, 1997 ; Pasquale, 1999 ; Gentner and Hulse, 2000). Therefore, the environmental factor may be as important as genetic factor during song development of the Zebra dove.

## References

- Gentner, T. Q. and Hulse, S. H. 2000. Female European starling preference and choice for variation in conspecific male song. *Animal Behaviour*, 59: 443-458.
- Lind, H. *et. al.* 1996. Female great tits can identify mates by song. *Animal Behaviour*, 52 :667-671.
- Pasquale, S. D. 1999. The ABCs of Birdsong. *Johns Hopkins Magazine*, April: 1-6.
- Slabbekoorn, H. and Cate, C. T. 1997. Stronger territorial responses to frequency modulated coos in collared doves. *Animal Behaviour*, 54: 955-965.
- Welty, J.C. 1982. *The life of birds*, 3 rd.ed. Philadelphia : Saunders college publishing. 754 pp.