

# SINGING BEHAVIOR OF WHITE-CRESTED LAUGHING-THRUSH (*Garrulax leucolophus*)

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## Abstract

The White-crested Laughingthrush's behavior and vocal communication were observed and recorded within Chiang Mai province from August 2005 to March 2006. Four vocal structures were identified as follows: short sounds, phrases, sentences, and subsongs. Short sounds consisted of three functions: a resting, feeding, and flying alert call, an excited call, and an invitation call. Phrases were commonly found in the terminal parts of sentences or subsongs. Birds raised their heads up with wings folded and moved their tails forward following the phrase's rhythm. Sentences often were begun by 1 to 4 birds while others in the flock followed in a chorus. The functions of the sentences' structure were found to be for alarm, excitement, contact, and mobbing. Subsongs consisted of 2 functions, contact and mobbing. Contact subsongs were used to keep the group in contact when moving and feeding. Mobbing subsongs were used to attack common enemies or other flocks in the feeding areas. The syntax of the mobbing subsongs was clear with rapid notes in the initial part and a long series of short harmonics in the terminal part of the subsongs.

**Keywords:** White-crested Laughingthrush, singing behavior, vocal communication, display

## Introduction

Acoustic signals are widespread among various animal taxa and they are often used as advertisement displays in habitats with dense vegetation and/or over long distances (Bradbury and Vehrencamp, 1998). These signals are most important for birds (Welty, 1982) in order to communicate not only with other species but also with themselves. Birds produce the sounds by expelling air from their lungs through the bronchi, trachea, and mouth, and passing it through the syrinx, or vocal organ, at the junction of the 2 bronchi with the trachea

(Fletcher, 1988). Visual displays, the combination of the bird's behavior and the feathers on its body, are the other communication signals which are very commonly used together with sounds (Catchpole, 1979).

The White-crested Laughingthrush (*Garrulax leucolophus*) is a bird of the order Passeriformes and the family Timaliidae. This species is highly gregarious and usually found in flocks, mostly feeds on the ground, and has loud, discordant calls (Lekagul and Round, 1991). It is common in Southeast Asia, from

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the Himalayas in the northwest to the southwest, from China to Sumatra, India to Indonesia (Ali and Ripley, 1972); Myanmar and Thailand in the north and west, and some parts of the east and northeast (King *et al.*, 1983; Round, 1988); but it is absent from central and southern Thailand, Malaysia, and Singapore (Shepherd, 2007)

Despite its particular sound and being a common resident in lowland habitats, little is known about its singing behavior. This study is, therefore, focused on the singing behavior of the White-crested Laughingthrush. Sound analyses were performed and comparisons were made among birds within and between sites in order to determine the sound functions.

## Materials and Methods

The sounds of the White-crested Laughingthrush were recorded at 3 main sites in Chiang Mai province, consisting of Muang, Doi Saked, and Chiang Dao from August 2005 to March 2006. The songs of individual birds were recorded on the ground, 3-10 m from the birds, until they either stopped singing or flew out of the recording range depending on the function of the sounds. Singing behaviors and a bird's display were observed when recording. The data was collected 3 times per week in the morning (6.00-10.00 h) and in the evening (16.00-18.30 h).

Recordings were made with an HHB professional minidisc recorder MDP 500 and a Telinga PRO4B dynamic microphone mounted in a 60-cm parabolic reflector. The sounds were analyzed and sonagrams were produced with Avisoft SASLab Light sound analysis software, with the following settings: sampling frequency 22050 Hz with 16-bit amplitude. In the sonagrams, the y axis represents the frequency (kHz) which approximates to the pitch; the higher the noise is, the higher it appears on trace. The time scale along the abscissa is usually in seconds. The sonagrams were analyzed in terms of elements, phrases, intervals, and frequency modulation to identify the species' recognition and repertoires. The smallest component of a White-crested

Laughingthrush sound is an element. A phrase is defined as a repetition of an element, 2 or more times (Mahler and Gil, 2009). The behaviors were compared with the sounds to confirm the functions of the sounds.

## Results and Discussions

Four vocal structures of the White-crested Laughingthrush were identified as follows: short sounds, phrases, sentences, and subsongs. These structures were analyzed from the frequency modulation and time scale of the sonagrams. Six functions of vocal communication were found by considering the display and behavior of the birds when they sang; these consisted of an alert call, excitement call, invitation call, alarm call, and contact and mobbing subsongs.

In the first structure, the short sounds, the voice is a simple emission of a few elements and the time intervals between individual elements are uncertain. Three types of sound functions are found with this structure. The first function is the alert call, which is a light voice for reminding themselves. For the White-crested Laughingthrush, alert calls occur in 3 situations: the resting alert call, single short elements between 0.5-2 kHz in 0.1-0.2 sec (Figure 1(a)), is soft with the mouth closed; the feeding alert call is used when birds are feeding or scratching on the ground, in which case the voice is similar to the resting alert call but sometimes has short wavering harmonic elements (Figure 1(b)); and the last type of alert call is found when birds are moving to change their position over a short distance (e.g., between branches), when the sounds are a long series of rapid oscillations (a buzzing sound) when the birds jump up, and a shorter series when they perch (Figure 1(c)). The second function is the excitement call that is used when they are excited or agitated, and which can be divided into 2 types depending on the level of excitement. These 2 types are the slightly excited case, which mostly occurs in birds in captivity or in zoos where birds respond with habitual behavior (Hinde, 1954), and the extremely excited case which occurs

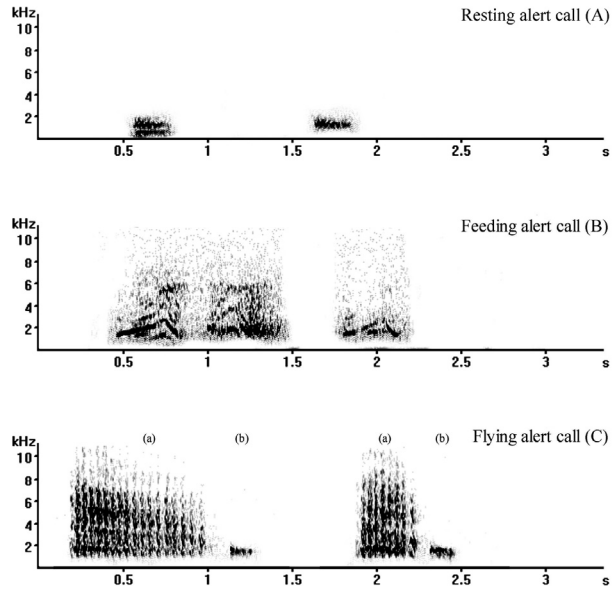


Figure 1. Sonograms of resting (A), feeding (B), and flying alert calls (C) by an individual White-crested Laughingthrush. (C)(a) The long series of rapid oscillation elements when a bird jumps up and the short elements when it perches (C)(b).

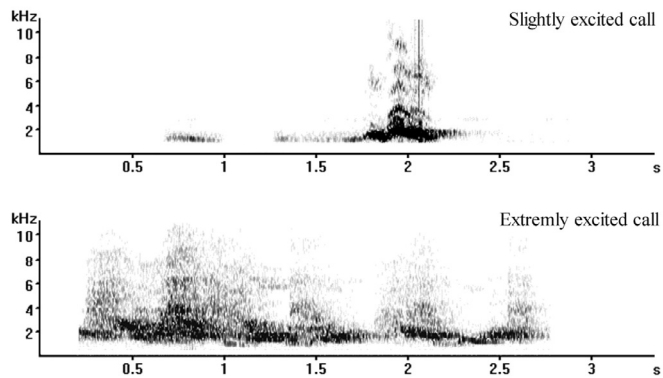


Figure 2. Sonograms of excitement calls in slightly and extremely excited cases

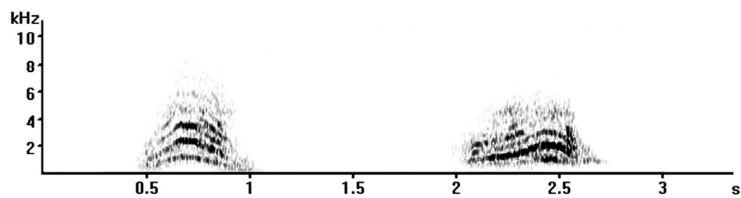


Figure 3. Sonogram of the wavering harmonic elements in an invitation call

when their feeding area is invaded. The slightly excited voices are loud, clear, and short (about 0.5-2.0 sec) but longer when birds are extremely excited (Figure 2). This type of voice always has interference elements in mobbing subsongs. The display behaviors of the excitement call are: holding their white crests upright, jumping around, and finally stopping uttering and flying away if they are still agitated. The last function, found with a short sound, is the invitation call which they use to stay in touch with their mates. The structures of the voices are a wavering harmonic sound with long intervals between notes (0.5-5.0 sec) (Figure 3). Birds fluff up their feathers, flutter their wings, and spread and shiver their tails while making the invitation call.

The second vocal structure is the phrase. Each phrase consists of a series of elements which occur together in a particular pattern (Catchpole and Slater, 1995). For the White-crested Laughingthrush, the phrase is commonly found in the terminal part of sentences or subsongs. Sometimes the structure is composed of more than 50 of the same elements in about a 15 sec duration (Figure 4). Birds raise their heads up with wings folded and move their

tails forward following the phrase's rhythm. There are also double-note phrases made by different individuals in a flock (Robson, 2004).

The sentence, the third of the vocal structures, is composed of elements which are either all the same (phrase) or different to form a long and complex structure. The sound functions with this structure of the White-crested Laughingthrush are alarm, excitement, contact, and mobbing. The sentences often begin with 1 to 4 birds while others in the flock follow in chorus. It is high in volume and clear when only 1 bird calls and repeats the sequence of a similar sentence several times (Figure 5). In the alarm call, many gregarious birds produce this voice upon encountering a predator. Such calls typically function to alert conspecifics to the presence of danger (Wheeler, 2010).

The last of the vocal structures is the subsong which is longer and more complex. A subsong consists of 1 or more sentences that have 2 functions, contact and mobbing. Contact is the most recorded function in the White-crested Laughingthrush because they are highly gregarious. Each individual contact

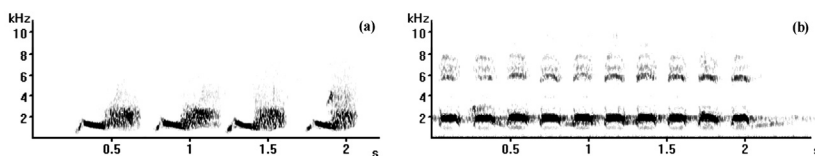


Figure 4. Sonograms of phrases which sometimes are produced alone (a) and sometimes in the terminal part of a sentence (b)

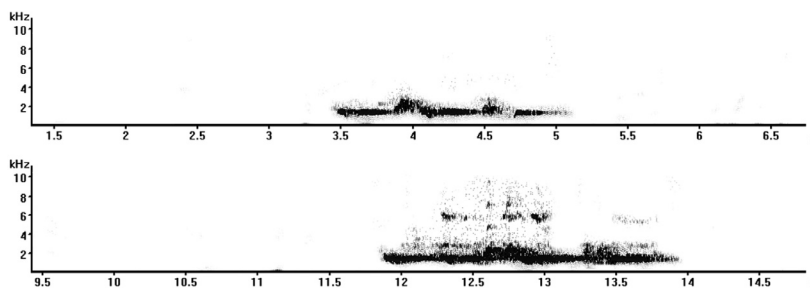


Figure 5. Sonograms of 2 alarm calls, showing the repeated call of similar sentences

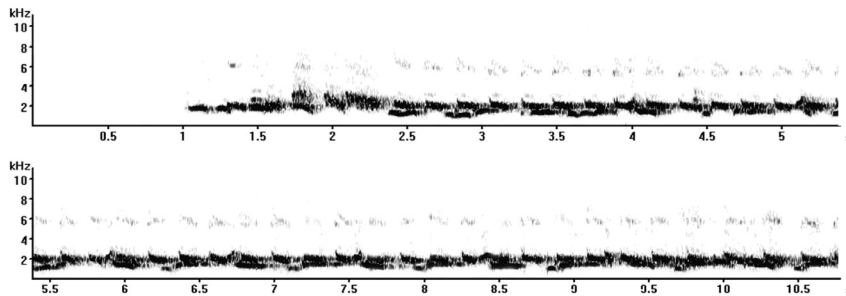


Figure 6. Part of mobbing subsong sonagrams, with the interference elements (1 kHz)

lasts about 5-20 sec. Contact is not only to keep the group in contact when moving, but also to enable each family to demarcate its food search area (Eve and Guigue, 2000), therefore, it was always found in every recording. Even though contact is composed of a variety of elements or phrases, its structure has its own pattern in which the whole structure or only the terminal part is always composed of a series of the same elements (phrase). In contact for moving or changing to another area, the first bird which sings will always take off first, and the next time the lead singer can switch to another in the flock. Mobbing is an aggressive action to compete against other flocks or species that approach the food resources. The syntax of a mobbing subsong is clear with rapid notes in the initial part and a long series of short harmonics (phrase) in the terminal part of the subsong with a loud and scolding voice. The low frequency elements (< 2 kHz) interfering in the syntax (Figure 6) are sometimes found in the mobbing subsong. Most bird species produce their feeding area sound from an elevated area to increase its effectiveness (Hoshang and Hare, 2006). Similarly, the White-crested Laughingthrush also does this to face an enemy's position. Furthermore, they also rapidly change the position around their location and perform restless wing and tail movements which are most commonly observed in passerines (Nocera *et al.*, 2008). Mobbing is ended when any flock is defeated and flies away.

The vocal structures of the White-crested Laughingthrush showed various types

of elements and syntaxes. According to the sonagram study, the vocal frequencies of birds range between 0.5-10 kHz and 182 element repertoires were found.

## Conclusions

The White-crested Laughingthrush produces a variety of sound acoustics which can be divided into 2 groups: calls—the vocal structures that are short and simple; and subsongs—the vocal structures that are longer and more complex. Because they are living in flock, most of their sounds are produced for social cohesion, such as the contact subsong, or for group survival, such as the alarm call and the mobbing subsong.

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