

(RESEARCH ARTICLE)



The first report of syllable analysis of the chattering lory (*Lorius Garrulus* (Linnaeus, 1758)) in the crooked beak sanctuary of Koli Village, Tidore Islands City, North Maluku

Abdu Mas'ud *, Ningsi Saibi and Sundari

Department of Biology Education, Faculty of Teacher Training and Education, Universitas Khairun, Indonesia.

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Abstract

The Chattering lory is an endemic bird with a restricted range in North Maluku. The crooked-beaked bird is one of the world's most popular types of domesticated birds, which negatively affects its long-term viability. The population estimate for chattering lory birds is between 46,360 and 295,540 heads. Poaching is the most significant factor contributing to population decline. An estimated 16,000 chattering lory are captured and sold annually. This study intends to analyze the syllables of bird sounds, as bird-sound-related research is still uncommon. The data collected from a Voice Recording of the chattering lory (*Lorius garrulus*) was then analyzed using Avisoft-SASlab Lite software. This study was conducted by recording bird sounds. The recording process (Analog Recording) is carried out within a specific time interval to record the birds' sounds multiple times. Bird sounds are recorded in the morning (07:00 to 10:00 WIT). The results indicated that the chattering lory's 131.4-second-long call consists of 18 syllables and four elements. The duration of a syllable varies from 0.51 to 0.66 seconds, and the duration between syllables ranges from 1.31 to 16.09 seconds. Also, the variable is the frequency of each upper and lower element. The lower element's frequency ranges from 100 to 12,100 kHz, while the upper element's frequency ranges from 1,500 to 18000 kHz.

Keywords: Chattering lory; Syllable; Spectrogram; Endemic Bird; North Maluku

1 Introduction

Indonesia is one of the countries with the greatest biodiversity in the world [1]. Indonesia is also one of the top 10 countries for "mega-diversity" and the largest legal and illegal supplier of wildlife products in Asia. With a total of 131 species, the illegal trade in birds is one of the causes of the global extinction of wildlife [2].

According to the International Union for Conservation of Nature and Natural Resources (IUCN), 11% of the 9040 known bird species are threatened with extinction [3]. Approximately 123 of the 356 crooked-beaked birds are threatened or endangered, and 16 are critically endangered [4].

There are nine species of crooked-beaked birds in North Maluku, including eclectus parrot, white cockatoo, and chattering lory. The high rate of smuggling endangers the populations of all three species. The crooked-beaked bird is one of the world's most popular domesticated bird species. They negatively impact the preservation of birds with crooked beaks. The first sanctuary in Eastern Indonesia, the crooked-billed sanctuary, is located in the village of Koli, Tidore Islands, North Maluku. This sanctuary protects crooked-beaked birds from poaching and exploitation by neighboring communities. The sanctuary serves as a community conservation center and recreational and educational area.

* Corresponding author: Abdu Mas'ud

Research that is usually carried out for the type of crooked beak includes the behavior of keeping crooked-beaked birds in North Maluku, the Activity of eclectus parrot (*Eclectus roratus*) at the Wildlife Rescue Center Kulon Progo Yogyakarta, the behavior of eclectus parrot (*Eclectus roratus*) towards changes in colony composition with different ages. Data on the behavior, type of feed the sound of crooked beak birds are still not widely carried out by researchers. For this reason, this study aims to determine the frequency, elements, and duration syllables of the chattering lory sound.

2 Material and methods

The study was conducted at the Crooked Beak Sanctuary for the process of recording bird sounds. The recording process (Analog Recording) is carried out within a certain time interval so that the sound of birds is recorded several times. Bird sound recording is done in the morning (07:00 to 10:00 WIT). The Voice Data is then transferred to a computer, and the sound recording is converted to a file with the Microsoft Waveform Audio Files (WAV) format. Visualization of snippets of useful phrases can describe the characteristics of sounds in the time domain by forming patterns of elements, syllables, and phrases.

The data from a Recording of the Voice of the chattering lory (*Lorius garrulus*) was analyzed using the computer program 'Avisoft-SASlab Lite.' To carry out the spectrogram analysis process, it is necessary to do an even smaller sampling so that the amount of data is not too large. Sound analysis was performed on sound snippets from the chattering lory (*Lorius garrulus*). The sound analysis measures the duration of the syllable, the element, the upper and lower frequencies, and the duration between the syllables.

3 Results and discussion

3.1 Analysis of an excerpt from the sound of the chattering lory (*Lorius garrulus*)

The syllable of the sound of the chattering lory consists of four elements with varying frequencies and durations. The spectrogram of the sound of the chattering lory reveals these characteristics.

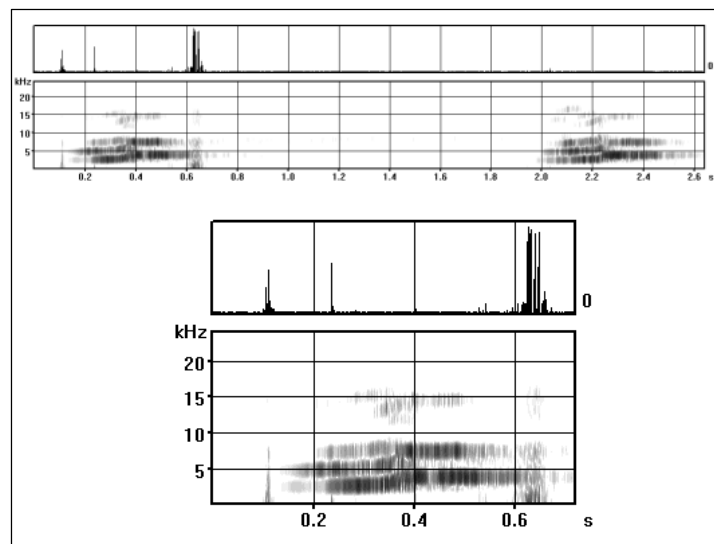


Figure 1 Spectrogram of chattering lory sound

With a duration of 131.4 seconds, the results revealed that the sound of the chattering lory consists of 18 syllables and four elements. The duration of a syllable varies from 0.51 to 0.66 seconds, and the duration between syllables ranges from 1.31 to 16.09 seconds. The duration of the chattering lory's voicelessness is detailed in Table 1 below.

Table 1 Total duration of sound chattering lory (*Lorius garrulus*)

	Duration syllables (s)	Element	Frequency		Duration between syllables (s)	Number of syllables
			low (Hz)	up (Hz)		
Average	0.60	1	994	3939	4.140	18
		2	3939	6250		
		3	6178	9439		
		4	10894	15589		
Range	0.51-0.66	1	100-1800	1500-5000	1.31-16.09	
		2	1500-5000	3700-8000		
		3	3700-8000	8400-10300		
		4	8400-12100	1700-18000		

Not all syllable chattering lory have the same frequency. The lower frequency range is between 100 and 12100 Hz, whereas the upper-frequency range is between 1500 and 18000 Hz. The typical lower frequency range is 994-10894 Hz, while the upper-frequency range is 3939-15589 Hz.

4 Discussion

Bioacoustics is an applied biological science that investigates sound properties, sound-producing organs, proper functions, sound physiology, sound analysis, and the advantages of animal and human sounds. "Sound science" is less developed than other fields of study. Nevertheless, given the importance of sound in life, bioacoustic research appears to expand as audio science and technology development. Even in modern times, the voice has become an economic commodity [5].

Birds use sound (vocalization) as a means of communication. The voices of songbirds (Oscines) and other birds [6], have different characteristics and sound qualities. There are two types of vocalizations in birds: the simple "call" and the more complex "song"[7]. In contrast to oscines bird sounds, which have a long duration, consist of a variety of syllable structures ('syllable'), and are frequently emitted by male birds during mating, simple sounds are typical of short duration. They can be produced by both male and female individuals [8]. Typically, a simple sound consists of a single sound element (a "note"), but a "note" can also be expressed as a syllable. Multiple simple sounds compose complex sounds [9].

According to the above study, the chattering lory's call lasts for 31, 4 seconds and consists of 18 canned sounds and four elements. The duration between syllables varies between 1.31 and 16.09 seconds, indicating that when the bird makes a sound, it does not have a specific duration of time. However, the sound emitted by the bird is likely affected by its environment. The bird is audible when the bird is squawking on the tree trunk. Uncertainty exists regarding the intent of the bird's call. Therefore, if various sound emissions and their relationship to behavior are studied, it is possible to compile a list of bird sound meanings [10].

The sounds produced by birds have both up and low frequencies. The next harmonic peak can determine by dragging the cursor over the current peak. The element value reveals that it has the highest peak. The peak of frequency rises from the lowest to the uppest value, beginning with the first element (low = 994 Hz; up = 3939 Hz), followed by the second element (low = 3939 Hz; up = 6250 Hz), the third element (low = 6178 Hz; up = 9439 Hz), and the fourth element (low = 10894 Hz; up = 15589 Hz).

Sound is a physical phenomenon produced by the vibration of an object as an analog signal with a continuously varying amplitude over time. Sound is a wave with multiple parameters (amplitude, deviation, frequency, and spectrum) that can differentiate one sound from another [11].

Sounds with greater amplitudes will be more audible. Sounds with a higher frequency will have a higher pitch. It occurs because the sound also possesses a color. The archetype of a sound wave determines the color of a sound.

Bird calls are a form of communication utilized by species-specific birds. The specific sound of each bird species will determine the effectiveness of communication in determining a bird's territory of dominance, reproduction, and survival. The ability to control the primary vocal organ (syrinx) varies among bird species, which accounts for one of the differences in sound [9]. Complex sounds are frequently imitated in particular contexts, which makes them relatively simpler to interpret. While simple sounds are typically imitated as communication between individual birds outside the mating season, more tough calls are used during the mating season [8, 9].

The presence of captive chattering lory in the Crooked Beak Sanctuary makes determining the intent of bird calls challenging. The chattering lory inhabits primary and secondary rainforests, selectively logged forests, and forest edges. It typically inhabits regions up to 1300 meters above sea level. The chattering lory bird's (*Lorius garrulus*) chirping is loud, nasal, and trembling.

5 Conclusion

Based on the results of the study above, the conclusion of this study is the sound of the chattering lory (*Lorius garrulus*) with a duration of 131.4 seconds consisting of 18 syllables and four elements with a duration between syllables ranging from 1.31-16.09 seconds which means that when the bird makes a sound, the bird does not have a specific duration of time. However, the possibility of the Sound emitted is influenced by the conditions experienced by the bird.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

Authors declaration

The authors hereby declare that the work presented in this article is original and that they will bear any liability for claims relating to the content of this article.

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