

**CROWING SOUND ANALYSIS OF GAGA' CHICKEN: LOCAL CHICKEN FROM SOUTH SULAWESI INDONESIA**Sri Rachma Aprilita Bugiwati<sup>1</sup> and Fachri Ashari<sup>1</sup><sup>1</sup>Faculty of Animal Husbandry, Hasanuddin University, Jl. Perintis Kemerdekaan Km.10, Tamalanrea, Makassar (90245), South Sulawesi, IndonesiaPhone: 0411-583111, Corresponding e-mail: [litasrirachma@yahoo.com](mailto:litasrirachma@yahoo.com)

**ABSTRACT:** Gaga' chicken was known as a local chicken at South Sulawesi Indonesia which has unique, specific, and different crowing sound, especially at the ending of crowing sound which is like the voice character of human laughing, comparing with the other types of singing chicken in the world. 287 birds of Gaga' chicken at 3 districts at the centre habitat of Gaga' chicken were separated into 2 groups (163 birds of Dangdut type and 124 birds of Slow type) which is based on the speed of crowing rhythm and total number of crowing syllables). The Dangdut type was separated again into 2 groups which were based on total crowing syllable (33 birds of long-group and 130 birds of short-group). The parameters were measured, recorded, and analyzed for crowing duration and number of crowing syllables (total, 1<sup>st</sup> wave, and 2<sup>nd</sup> wave) using the voice recording tool and software Sound Forge Xp.10. Average crowing duration (second) of long-Dangdut group, short-Dangdut group, Slow type were 30.8 seconds, 4.2 seconds, and 3.7 seconds, respectively while those for total number of syllables were 143, 21, and 8, respectively. Crowing duration of Gaga' chicken was longer than Pelung chicken as singing chicken of Indonesia and Koeyoshi chicken as singing chicken of Japan while those for number of syllable were more than Kokok Balenggek chicken as singing chicken of West Sumatera. The crowing character of Gaga' chicken could be as identifier as one of singing chicken in Indonesia and as a criterion selection of melodious crowing chicken.

**Keywords :** Gaga' chicken, singing chicken, crowing syllable, crowing duration

**INTRODUCTION**

The singing chicken of Indonesia is one of the nation's domestic poultry which have a long rhythm, melodious sound, and different style-tone-tempo of crowing. The singing chicken in Indonesia, such as Pelung chicken from West Java, Bekisar chicken from East Java, and Kokok Balenggek chicken from West Sumatra have exceptionally long crow, unique, and different kind of crowing sound [15]. It make connoisseur breeders have bred certain types of those chicken exclusively for this trait. Sidenreng Rappang (Sidrap) District, South Sulawesi, Indonesia has an excellent potential of local chicken which have different bioacoustic character with the other singing chickens, that has been known, and have not cultivated yet. The unique and exclusive singing chicken was known as the Gaga' chicken or the Bugis local language was called *Manu' Gaga'*. The specificity of crowing sound of Gaga' chicken was the stuttering voices especially at the ending of crowing sound which is like a human laughing. Therefore be named of "Ketawa/laugh-chicken". The "Gaga' chicken have several various types of crowing sound (Dangdut and slow types). This chicken was included in the category of germplasm of South Sulawesi Indonesia and already legally as a local poultry of South Sulawesi by the Indonesian Agriculture Ministry decree in 2011 but there is no scientific information of the phenotypic description, morphological traits, reproduction traits, production traits, and the blood scheme related with an examination of biochemical polymorphisms of the Gaga' chicken, yet. The information on the Gaga' chicken would be useful in optimizing both conservation and utilization strategies for indigenous chicken genetic resources in Indonesia.

In Indonesia, there was already identified the 12 breeds of chicken as ornamental chicken based on their voice and as fighting cocks which is regarded as chickens with power, and also 4 breeds of chicken are known as broilers [11,12].

On the other hand, the blood samples of 15 breeds of indigenous chicken of Indonesia were also already checked [16] but the information of Gaga' chicken which have a superiority of crowing sound has not been discovered yet. The information of the Indonesian chicken native breeds as a genetic resource has received very little scientific attention and current research efforts have been directed primarily towards enhancing commercial production system especially in crowing character.

Gaga-chicken were generally raised and breed at the central habitat of Gaga-chicken at Sidrap District, South Sulawesi which is formerly only maintained and proliferate in the royalty as social status symbol of the Bugis lord. The external performances of Gaga-chicken were almost similar as the other domestic and local chicken. The crowing champion of Gaga-chickens, that have good melodious crowing sound, have a high selling price. It will be as high potential economic value for the farmer. Gaga' chicken was spread to many places in Indonesia and many uncontrolled mating were done. Some concerns about the purity of Gaga' chicken was needed. However, the study of Indonesian native chicken breeds as genetic resources has received very little scientific attention and current research efforts have been directed primarily towards enhancing commercial production system. Unfortunately, the crowing sound research of Gaga' chicken have never done so that the information is very important and needed. Therefore this study is aimed to analyze the bioacoustic of crowing sound of Gaga' chicken for providing more accurate data that can be used in breeding and development of Gaga' chicken as one of the ornamental chicken in Indonesia.

## **MATERIALS AND METHODS**

The research on bioacoustic of crowing sound of Gaga' chicken have been carried out on January to December 2012 at Sidrap District, South Sulawesi, Indonesia as central of raising and breeding of Gaga' chicken. The Gaga' chicken were reared by local farmer using traditional rearing management system with similar feeding system with the other Indonesian local chicken. In this experiment, the Gaga' chicken were separated on two groups, that is "Dangdut" type which have faster rhythm of crowing, more number of crowing syllables (more than 8 beat of crowing), and longer duration of crowing while "Slow" type which have slower rhythm of crowing, less number of crowing syllable (4-6 beat of crowing), and short duration of crowing. Especially for "Dangdut" type were separated again to be "Long-Dangdut" group which have number of crowing syllables over than 10 (s) and "Short-Dangdut" group which have number of crowing syllables less than 10 (s). The bioacoustic of crowing sound from 124 birds of "Slow" type, 33 birds of "Long-Dangdut" group, and 130 birds of "Short-Dangdut" group of Gaga' chicken were recorded and checked for total crowing duration (crowing duration from the first to the end of crowing), 1<sup>st</sup> wave of crowing durations (starting crowing sound which is sounds like usual crowing sound of rooster and have high tone), 2<sup>nd</sup> wave of crowing durations (crowing sound which is sounds like human laughing sound), total number of crowing syllables, and number of crowing syllables at 1<sup>st</sup> and 2<sup>nd</sup> waves, respectively.

The crowing sounds from each bird were recorded using the sound recording tools and those sounds were digitalized to the computer by using the software of Sound-Forge Xp.10 to show the bioacoustic visualization graphics as wave form. All parameter informations were interpreted from the bioacoustic graphic to be the data. All data were analyzed using basic statistic method to know the mean and standard deviation of each bioacoustics character.

## **RESULTS**

### **Crowing Voice Analysis**

The crowing sound ability of Gaga' chicken was shown at Table 1. The result showed that Long group of Dangdut type of Gaga' chicken has the longest total crowing duration of 30.83 seconds comparing with the short group of Dangdut type (4.2 seconds), Slow type (3.68 seconds) or the others of singing chicken, such as Pelung chicken (10.9 seconds) [7], Kokok Balenggek chicken (2.08 - 4.43 seconds) [16] and Japanese singing chicken (15 seconds) [20], respectively. It shows that Gaga' chicken have long character of crowing duration as other singing chicken in Indonesia and Japan.

The crowing durations of 1<sup>st</sup> wave (around 0.96 to 1.11 seconds) and number of crowing syllables at 1<sup>st</sup> wave (around 2 seconds) of Gaga' chicken were near similar for all types and groups. Conversely, different results of crowing duration and number of crowing syllable were shown at 2<sup>nd</sup> wave.

Long-Dangdut group showed the longest of crowing duration at 2<sup>nd</sup> wave (29 seconds) and have the most number of crowing syllables at 2<sup>nd</sup> wave (141 syllables). The crowing voice at 2<sup>nd</sup> wave of Gaga’ chicken was the unique characteristic and become a distinct trait among the singing chicken in the world. Those unique crows sound of Gaga’ chicken was heard like a voice of human laughing and those phase always taking the longest duration of crowing sound.

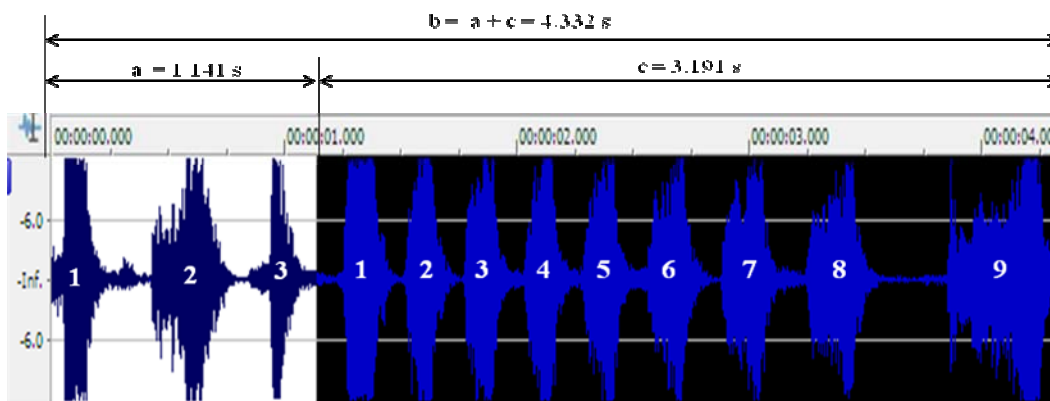
**Table 1. The crowing sound of “Gaga-chicken” at Sidrap district, South Sulawesi**

Crowing sound	Dangdut-type		Slow-type (124 heads)
	Long Group (33 heads)	Short Group (130 heads)	
Total crowing duration (seconds)	30.83 ± 19.67	4.20 ± 1.80	3.68 ± 1.08
At 1 <sup>st</sup> wave (seconds)	0.96 ± 0.38	0.98 ± 0.61	1.11 ± 0.62
At 2 <sup>nd</sup> wave (seconds)	29.89 ± 19.77	3.21 ± 1.78	2.65 ± 1.06
Total number of crowing syllables	143.97 ± 97.65	21.36 ± 9.72	8.36 ± 2.67
At 1 <sup>st</sup> wave	2.21 ± 0.74	2.66 ± 0.77	2.49 ± 0.67
At 2 <sup>nd</sup> wave	141.79 ± 97.95	18.46 ± 9.74	5.91 ± 2.46

Average number of crowing syllable of Gaga’ chicken, especially Long-Dangdut type, showed more syllables (143 syllables) than Kokok Balenggek chicken which is known as the chicken with many crow syllables of 24 syllables [16] and also than Bekisar chicken which only have two syllables but have good harmony in the magnitude of a voice, beautiful voice, very loud with a voice rising edge, no stuttering and clarity voice [19]. The Gaga’ chicken and Kokok Balenggek chicken has similarity of the unique crowing at the 2<sup>nd</sup> wave. The Kokok Balenggek chicken has the average syllables at 2<sup>nd</sup> wave of 5.07 (range of 6-15) with the unique gradual crowing sound called *lenggek* sound. The Gaga’ chicken have more number of average syllables (141.79 syllables of the long-Dangdut group and 18.46 syllables of the short-Dangdut group) at the 2<sup>nd</sup> wave which is the phase of “laughing voice”.

**Waveform patterns of crowing sound**

Waveform is a crowing sound visualization in the form of graphs that is useful for describing crowing sound patterns. Visualization of the total duration of crowing, crowing duration of 1<sup>st</sup> and 2<sup>nd</sup> wave, number of syllables of 1<sup>st</sup> and 2<sup>nd</sup> wave can be seen in Figure 1. Figure 1 showed the crowing sound graphs from a Gaga’ chicken. Based on the analysis of crowing sound waveform using the program forge XP 10, it can be seen that a crowing sound sequences consisting of two phrases (waves). Graph ‘a’ showed the crowing sound at 1<sup>st</sup> wave which is consist of three syllables and have 1.141 seconds for crowing durations. Graph ‘b’ showed the crowing duration at 2<sup>nd</sup> wave which is consist of nine syllables and have 3.191 seconds of crowing durations. Total crowing duration was 4.332 seconds. All graphs of crowing sound from all Gaga’ chicken could be saved at the computer and could be rehearing.



- a. Crowing duration and number of syllable at 1<sup>st</sup> wave (1.141 seconds; 3 syllables)
- b. Total crowing duration (a + c = 4.332 seconds)
- c. Crowing duration and number of syllables at 2<sup>nd</sup> wave (3.191 seconds; 9 syllables)

**Figure 1. Bioacoustic results of “Gaga’ Chicken” using Sound Forge Xp.10**

## DISCUSSION

There is extreme diversity in the sound types and the syntactical arrangements of those sounds which was produced by the roosters. The roosters produce simplest individual sounds of “song elements”. A series of one or more elements that occur together in a regular pattern in song is referred as a song “syllable”. A sequence of one or more syllables that occurs repeatedly in song is described equivalently as either a song “phrase”. A particular combination of phrases that occurs repeatedly constitutes a song “type”. Finally, a sequence of one or more phrases separated from other phrase sequences by silent intervals of variable duration [3]. Those are the fact that every strain of crowing chicken has different character

At Sidrap District ,South Sulawesi province, Indonesia as the central habitat of Gaga’ chicken, crowing sound characters were separated into three categories based on the differences of crowing sound character. It were Dangdut type, Slow type, and Crystal type. In addition, the crowing character of Gaga’ chicken could be separated to three phrase. First phrase was a starting crowing sound with high tone, second phrase was “unique crowing laughing sound”, and third phrase was finale crowing sound as rare sound with a specific short duration of crowing sound. The third phrase of crowing sound was only found by crystal type, as the best grade and the highest price of Gaga’ chicken. Similar condition was found at Kokok Balenggek chicken which also have three segments of crowing sound called *lenggek* [16].

The crowing sound of Pelung chicken have high and long voice [7], large initial volume of sound, clarity, rhythm and loudness [13]; Bekisar chicken have a beautiful voice and very loud with a rising edge voice; Kokok Balenggek chicken have long crows in a rhythm and melodious voice [18]. In Japan, three chicken varieties such as the Toutenkou (Japanese Red Crower), Koeyoshi (Japanese Good Crower), and Toumaru (Japanese Black Crower) have been specifically bred to develop an exceptionally long crow and be known as “the three major Japanese long crowing breeds” [20]. Toutenko is characterized by long crowing in a high-pitched tone; Koeyoshi is characterized by long crowing as with the Toutenkou but crows in a low key; Toumaru can crows also classified as a long duration crow as the Toutenkou and Koeyoshi. The Toumaru was crowing in an intermediate-pitched tone between the Toutenkou and Koeyoshi. However, those results showed that Gaga’ chicken has ability to crow as long as singing chicken type in the world.

The results showed that Gaga’ chicken have more number of crowing syllables and crowing duration than the other singing chicken type. This result can be used as one of selection criteria of best rooster of Gaga’ chicken in developing of the singing type of chicken in Indonesia. Crowing sound waveform patterns can also be used as one identifier (marker) of a nation in Indonesian chickens and as a criterion selection of melodious crowing rooster [15]. Unfortunately, there is very limited information at scientific journal about crowing ability of the native crowing chickens in Indonesia.

### Crowing Traits Inheritance

The crowing behavior or singing character has well-defined acoustic structures that are characteristic of only male avian species [10] while females only producing calls [5]. Singing character of male has two main functions such as to declare a defense territory from which other chicken are aggressively excluded and may also be used by males to attract females to mate with them, as well as to stimulate the reproductive behavior and physiology of females [5,8]. Song or crowing behavior was controlled during periods of reproduction activity [14] by the gonadal steroid of testosterone [1].

Two major avian memory paradigms were birdsong learning and imprinting. The crowing behavior of Gaga’ chicken was estimated as culturally inherited traits [9] whereas a male progeny will imitate and learn their crowing sound from an adult tutor male or their father when they are young. This phenomenon is called as the imprinting process [6]. Juvenile birds will not develop normal song behavior if they do not hear the song of conspecific adults from live tutor. Young birds must then be able to hear themselves sing to develop a crystallized version of the conspecific song model acquired during the earlier memorization phase [3]. The imprinting behavior was an interaction between instinct and song learning [4]. The singing behavior of bird include the avian is not genetically inherited but are determined by the practice experience since early age [6].

### Using the Sound Forge Xp 10 on Chicken Singing Contest

The winner criteria of the “Gaga-Chicken singing contest is the chicken who produce the largest number of syllables, the longest of crowing duration beside the judgment of the fineness of crowing sound character. The Sound Forge Xp 10 program could be facilitates, visualize, and improve the judgment accuracy of the crowing duration and the number of syllables at the contest.

Utilization of technology applications of bioacoustic analysis can reduce the subjectivity factor of the judge at the contest, especially the Gaga' chicken has many number of syllables and longer of crowing duration than the other singing chicken in Indonesia such as Kokok Balenggek, Pelung, Bekisar chickens and also the three Japanese singing chickens.

## CONCLUSION

The Gaga' chicken have a unique of crowing sound, different characteristic and superior of bioacoustic quality (crowing duration and total number of syllables) compare to the other singing chicken in Indonesia (Pelung, Bekisar, and Kokok Balenggek) and Japan (Koeyoshi, Toutenkou, and Toumaru).

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## REFERENCES

- [1] Arnold A P, Nottebohm F and Pfaff DW. 1976 . Hormone accumulating cells in vocal control and other brain regions of the zebra finch (*Poephilla guttata*). *J. Comp. Neurol.* 165(4):487–511.
- [2] Bolhuis J J and Gahr M. 2006. Neural mechanisms of birdsong memory. In: *Nature Reviews, Neuroscience*, 7:347-357.
- [3] Brenowitz E A, Margoliash D, Nordeen K W. 1997. An introduction to birdsong and the avian song system. *J.Neurobiol*, 33(5):495-500.
- [4] Cardoso S H and Sabbatini R M E. 2004. Learning who is your mother, the behavior of imprinting. <http://www.cerebromente.org.br/n14/experimento/lorenz/index-orenz.html>. [17 Desember 2012].
- [5] Catchpole C K and Slater P J B. 1995. *Birdsong: Biological Themes and Variations*. Cambridge University Press, Cambridge.
- [6] Grant P R and Grant B R. 1997. Genetics and the origin of bird species. (in) *Proc. Natl. Acad. Sci.* 94(15): 7768 – 7775, held on 30January–1February 1997, at the National Academy of Sciences, Beckman Center in Irvine, CA, USA.
- [7] Jarmani S N and Nataamijaya A G. 1996. Karakteristik suara ayam Pelung. (in) *Seminar Nasional Peternakan dan Veteriner, Cisarua Bogor, Indonesia*, held on 7 – 8 November, 1995, Puslitbang Peternakan, Bogor, 819 – 823.
- [8] Kroodsma D E and Miller E H. 1996. *Ecology and Evolution of Acoustic Communication in-Birds*. Eds. Comstock, Ithaca, NY.
- [9] Marler P and Doupe A J. 2000. Singing in the brain. (in) *Proc. Natl. Acad. Sci.* 97(7): 2965 – 2967, held on 2000, at the National Academy of Sciences, Beckman Center in Irvine, CA, USA.
- [10] Morton E S. 1996. A comparison of vocal behavior among tropical and temperate passerine birds. In: *Ecology and evolution of acoustic communication birds*. D. E. Kroodsma and E. H. Miller, Eds. Comstock, Ithaca, NY, pp. 259–268.
- [11] Nataamijaya A G, Jarmani S N and Sartika T. 1996. Konsep strategi penanganan pelestarian plasma nutfah pertanian secara ex-situ ternak ayam buras. *Proyek Pemanfaatan dan Pelestarian Plasma Nutfah Pertanian*, Bogor.
- [12] Nataamijaya A G. 2000. The native of chicken of Indonesia. *Plasma nutfah bulletin*. 6(1). Balai Penelitian dan Pengembangan Pertanian, Departemen Pertanian, Jakarta.
- [13] Nataamijaya A G. 2005. Karakteristik penampilan pola warna bulu, kulit, sisik kaki, dan paruh ayam Pelung di Garut dan ayam Sentul di Ciamis. *Buletin Plasma Nutfah*. 11(1):1-5. Balai Penelitian dan Pengembangan Pertanian, Departemen Pertanian, Jakarta.

- [14] Nottebohm F and Arnold A P. 1976 . Sexual dimorphism in vocal control areas of the song bird brain. *Science*. 194(4261):211–213.
- [15] Rusfidra. 2007. Bioacoustic Assessment of The Balenggek Crow Chicken “The Local Sing Fowl” from West Sumatera. (in) Seminar Nasional Teknologi Peternakan dan Veteriner, held on 21-22 Agustus 2007, Puslitbang Peternakan, Bogor. Indonesia.
- [16] Rusfidra. 2009. Analisis Suara Kokok pada Ayam Kokok Balenggek; Ayam Lokal Berkokok Merdu dari Sumatera Barat. (in) Simposium dan Kongres Nasional Peripi ke-VI, held on 18-19 November 2009, Bogor.
- [17] Sulandari S, Zein M A A and Sartika T. 2008. Molecular characterization of Indonesian indigenous chickens based on mitochondrial DNA displacement (d)-loop sequences. *Hayati Journal of Biosciences*, 15(4): 145-154.
- [18] Susanti T, Sopiyan S and Iskandar S. 2007. Ayam Kokok Balenggek : Sumber plasma nutfah yang hampir punah. *Warta Penelitian dan Pengembangan Pertanian*.29(4):10-11.
- [19] Tarigan N and Hermanto S. 1991. *Bekisar : Pemeliharaan dan Pengembangbiakan Secara Modern*, Kanisius, Yogyakarta.
- [20] Tsudzuki M. 2003. Japanese Native Chickens. Laboratory of Animal Breeding and Genetics, Graduate School of Biosphere Science, Hiroshima University, Higashi-Hiroshima, Hiroshima, Japan. The Relationship between Indigenous Animals and Humans. (in) APEC Regions, Chang, H.L. and Y.C. Huang (Eds.). The Chinese Society of Animal Science, Taiwan, Tainan, pp:91-116.