

A Study On The Use of Tiger's Roar Against Wild Boars

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Abstract: Several cases of applying the roaring sound of tigers to reduce crop damage caused by wild boars have been reported in Korea. However, its effects have been mitigated due to the improper implementation of the sound and repetition effects acquired by wild boars necessitating the establishment of a sustainable sound system with more proper security measures. This paper analyzes three different roars of tigers from acoustic point of view and employs an improved method of broadcasting the most realistic roar in order to prevent wild boars from damaging crops.

Keywords: Wild boar, crop damage, tiger roar, sound characteristics, wild animal repelling system

1. Introduction

There are many farmers farming near hills and mountains in Korea due the fact that over 70 percent of the land covers mountainous areas. However, near the mountains, various wild animals including wild boars and water deers often attack the villages and damage crops and even people in the farm. According to the government statistics in 2013, the damage caused by wild animals is over 10 billion won every year (13.3 billion in 2008, 12.7 billion in 2009, 13.2 billion in 2010, 15.4 billion in 2011, and 12.1 billion in 2012), and government compensation is basically on the rise but currently stays at 35%. [1] Hence, damage caused by wild animals, especially wild boars, are in reality a direct share of problem for the farmers.

In general, farmers take measures to prevent such problems by placing traps or creating electrical fences. For instance, according to a research conducted in 2014 for preventing crop damage caused by water deers, several solutions including installing electrical fences, gaining density (population) control, and planting screen plants have been proposed. [2] However, wild boars are very large in size and power making fences useless. Hunting licenses have been given to reduce its numbers but did not prove to be the optimal solution. Moreover, farmland at nighttime helplessly becomes a land for wild animals. Even security guards are of no help against wild boars and their quick instincts.

Such methods could not solve the problem, thus at places like Kang-jin, Jeollanam-do, a roar of a tiger

could be heard at 12 and 6 o'clock where a tiger cave resides. Before the village people broadcasted the tiger roar, a wild boar living near the hills used to appear every now and then and damaged crops. In order to scare off the boar, they tried many things including installing scarecrows and even firing off guns but it did not have much effect. On the other hand, when turning on the recorded sound of tigers' roar, the rate of boar appearance reduced. The effects especially heightened when the speakers were placed in a housing near a cave.

In this study, sound characteristics of various tiger roars were analyzed along with the improved effects when placing the speakers into a housing. Furthermore, the study examines the most effective way to use the roar of tigers against wild boars.

2. Study of a tiger's roar

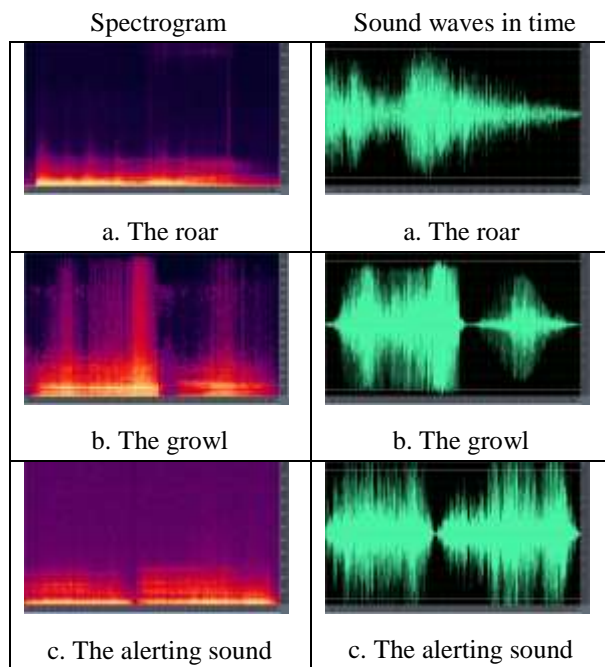
A tiger's roar has the characteristics of a strong low frequency sound as illustrated in Figure 1 below.

This characteristics is mainly due to the tiger's body shape, long and large body, thick neck and tongue, sharp teeth, and strong vocal cords. Moreover, a tiger, being a carnivore, has strong yet flexible muscles with large lungs. Such characteristics of a tiger is what creates the charismatic roar. Especially, the reason behind such a roar is due to the elastic hyoid bone while other cats have hard hyoid bones.

Thus, the carnivorous roar of a tiger instinctively stimulates the defense mechanism of animals in the lower part of the food chain including wild boars,

causing them to avoid approaching any closer. However, if the roar is repeatedly heard and its source does not appear every time, wild boars will begin to realize its false alarm through experience and then they attack the village and crops will be damaged once again. In order to prevent wild boars from acquiring repetition effects, many roars of a tiger must be collected and even created for modeling.

animals. Figure 1 shows the acoustic analysis of a. roar b. growl and c. alerting sound of tigers via spectrogram, spectrum, as well as sound waves in time. The first (a) roar shows a strong low frequency sound below 100Hz with a wide bandwidth. The second (b) growl not only shows a low frequency sound below 100Hz but also mid and high frequency sound above 100Hz caused by the trembling of vocal cords and hyoid bones acting as a cushion. The last (c) alerting sound shows a wide bandwidth near 100Hz with weak low frequency sound but with husky and a full range of frequencies similar to the that of white noise energy. The last sound would be produced to intimidate the opponent. In order to construct a system for fending off wild boars, various roars of tigers must be utilized and broadcasted in alternation.



3. Wild Animal Repelling System Using Tiger's Roar

Tiger habitation is normally near a mountain in a cave or between boulders. They are nocturnal and begin to hunt after sunset in the higher grounds of hilly sections. These attributes of a tiger gave the idea for farmers living near mountainous areas, where wild animals damaged crops, the idea to use the roars of a tiger to protect their farmland.

Furthermore, a tiger's vibrant color and stripes and intense eyes during night along with a unique smell frightens other animals eventually scaring them off. Figure 2 illustrates the suggested system for repelling wild animals using a tiger's roar.

In order to maximize the effects of repelling system, a tiger's roar along with a system consisting of a tiger replica with proper surrounding must be constructed. The principle behind such a system lies in using the fancy fur and agility of a tiger overwhelming wild animals visually while the roaring sound paralyzes their mind through the ears via ultra low frequency and fends them off by alternating between mid and high frequency roars. The replica in actual size of a tiger is to be placed on a wagon above pre-installed rails near the plow and is to be moved left and right. It is important to use various roars simultaneously for establishing a more realistic and proactive system.

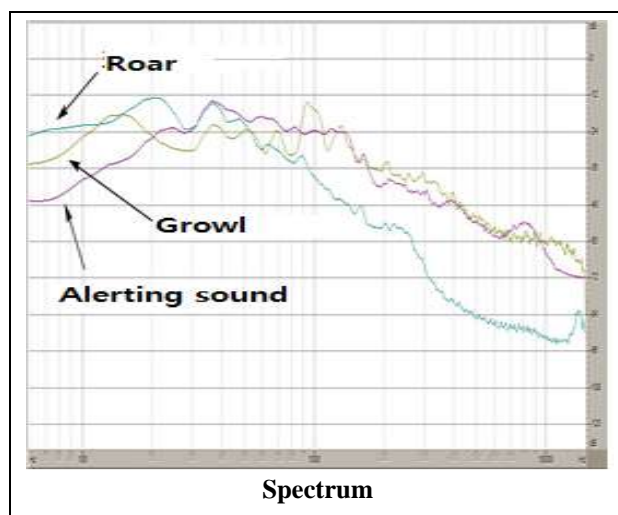


Figure 1. Comparative analysis of three tiger's roars

A tiger creates different sounds depending on whether it is intended to other tigers or to other



Figure 2. Proposed Wild Animal Repelling System Using Tiger's Roar

As a part of the system, the roar must sound as if a tiger is roaring in a cave, thus the speakers must be placed in a housing to increase the resonant characteristics which will result in improved effects. When the speakers are placed in a housing, the tiger's roar proved to be more grandeur. Normally, a tiger's roar is between 7~15 Hz, a low frequency sound as a base lower than 500Hz sounds much louder at 125dB. By resonating the roar in a housing, the sound is amplified while simultaneously protecting the player machine and speakers. When we conducted a preliminary test by placing speakers in a housing within the cave in a town with a nearby tiger's cave, the resulted amplification reached to ultra low frequency below 50Hz, creating a better roar.

Figure 3 shows that when the sound is broadcasted in a housing, low frequency characteristics are amplified compared to the one broadcasted using normal speakers. Consequently, the low frequency characteristics are amplified primarily by the housing and is further increased by the cave resulting in a loud roar. When this method was used, wild boars no longer approached the farmland. Moreover, the ultra low frequency of the cave seemed to have stimulated the senses of other wild animals letting them realize the austere roar which in turn effectively prevents them from approaching farmlands and houses.

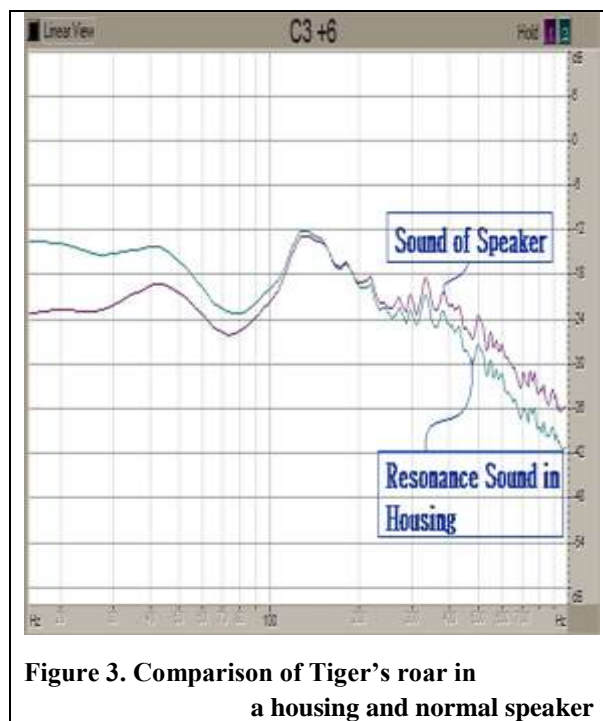


Figure 3. Comparison of Tiger's roar in a housing and normal speaker

4. Conclusions

Tigers in our country have gone extinct during the Japanese colonial era when the Japanese tried to decline our strength and vigor by placing iron stakes in mountains--a belief that is said to sever connections which lead to hunting tigers. After that, lynx and other animals in the cat family have populated and controlled the natural ecosystem. Since wild animals such as wild boars cannot be controlled without tigers, tiger extinction resulted in the attacks of wild boars to the villages causing crop damage in farmlands near the mountains. In order to prevent such damage, tiger roars have been used over many regions in the country. Such reports have led to the necessity of researching tiger roars to help mitigate crop damage in other farmlands in mountainous areas. This paper sufficiently observed and obtained results that a tiger's roar with its low frequencies as well as the entire range of frequencies within the roar is significantly effective for preventing wild boars from damaging crops. Furthermore, it was suggested that in order to counter the repetition effect and learning abilities of wild boars, various roars must be collected and even created using a Foley sound method to select for better modeling while providing visual effects for an improvement of wild animal repelling system at the same time.

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