

Tree Removal Changed The Drumming Behaviour of A Japanese Pygmy Woodpecker

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Abstract

The Japanese pygmy woodpecker (*Dendrocopos kizuki*), called “kogera” in Japanese, normally drums on trees. However, during observations conducted over seven years in the Satoyama landscape of Japan, the author discovered the unique behaviour of a Japanese pygmy woodpecker individual. The woodpecker often preferred to drum on metal plates of telephone poles to seek the metal’s specific high-pitched sound. This case study suggests that landscape diversity can translate into behavioural diversity within species.

Main

Woodpeckers use drumming as a communication signal. However, it is possible that specific drumming features indicate play behaviour. Studies have shown that woodpecker species can have similar or different drumming types²⁴⁻²⁷. Furthermore, many researches have reported that species richness and behaviour of woodpecker are strongly influenced by tree availability and landscape^{19,20,21}. Therefore, more variations of drumming types may be discovered, even within species, using observational studies. Therefore, it is important to investigate intra-specific drumming activities in more detail to better understand the complexity of the behaviour of a species, which will consequently help in understanding individual diversity. However, specialty and universality of drumming types are often difficult to differentiate. They could reflect a common community-related performance, or a specific and unique activity, such as playing. Furthermore, logging trees and degraded environments may change the behaviour of birds and other species. Human activities, including deforestation and urbanization as well as capturing a butterfly and felling down of a tree, causes possible severe effects on wildlife¹²⁻¹⁸. The Satoyama is a Japanese term for marginal areas between the foothills and the arable land. Being a border area, several species are not found consistently in this region ever year.

This means that the area is vulnerable to individual life and death.

In the present study, the author studied the drumming activities of Japanese pygmy woodpecker (*Dendrocopos kizuki*) in the Satoyama landscape of Japan. The Japanese pygmy woodpecker is endemic to Japan but only few studies have reported the biology and behaviour¹⁻⁶ of the species. To illustrate how acoustic patterns can reflect individual characteristics, author adopted dawn recordings of an individual Japanese pygmy woodpecker over an observation period of five years.

The recording from 7 April 2020, 6:39 AM, showed that the bird moved from one side to the other side of the metal plate on top of the telephone pole. After a short moment, the woodpecker drummed the plate part, which created a low-pitched sound; then it returned to the part that creates a high-pitched sound and continued drumming there. The video recorded on 11 April 2020, 7:19 AM, documented the same behaviour (Figure 1). The drumming sound was detectable from a distance of 200 m. The last observation of the bird in 2020 was on 15 April 2020. In July 2020, the approximately 50-year-old cherry tree near the phone pole was felled. Although the landowner sold the adjacent land for housing

development, the bird came back the following year to drum in the same pattern as observed in 2020. On 18 and 19 March 2021, the Japanese pygmy woodpecker was discovered on another pole, approximately 70 m south of the first observed pole, where it displayed the specific drumming behaviour.

The survey videos showed that the Japanese pygmy woodpecker liked to drum the surface of the metal plate on top of the telephone pole. The bird continued the drumming for approximately 30 minutes. No other Japanese pygmy woodpeckers were in the area during this time.

At first, it seemed that the Japanese pygmy woodpecker drummed the metal plate randomly. However, after further observation it became notable that the bird seemed to seek and carefully select the point of the metal plate that creates the highest-pitched sound. First, it drummed the left side of the metal plate and moved to the right side of the plate, which created a lower-pitched sound. Then, the bird moved back to the west side, which has a higher and clearer tone. On the left side of the plate, the bird continued to compare different tones by drumming different sections of this side of the plate. It selected the middle section of the left side plate—the section that created the highest-pitched sound—to continue drumming for more than 20 minutes on average before it flew to the Satoyama forest. Whenever the same bird drummed the plate of the pole, it moved between the right and left sides, comparing the different sounds, and then selecting the left side for continuous drumming. In fact, the Japanese pygmy woodpecker individual knew which side of the plate creates higher-pitched sounds, but moved first between the two sides before finally choosing the left side. Therefore, author assumed that the bird enjoyed the comparison of the sound change.

Moreover, research on woodpecker communities showed that as long as drums are acoustically as different as those detected in the entire clade, species within a community do not need drums which sound as different as possible¹. However, the bird observed in this study did not drum on trees, but always drummed the metal plate of a phone pole. During the drumming, no other Japanese pygmy woodpeckers were noticed in the study area, and when they were present in pairs, no drumming activity was displayed. Overall, it can be said that the observed drumming activity may indicate play behaviour, rather than communication. The drumming behaviour on the phone pole was first observed in winter 2018 and lasted till early spring 2019. The bird began drumming around 6:00 AM and continued for approximately 30 minutes. The behaviour has also been observed from winter 2019 till early spring 2020. In spring 2021, after the cherry tree was removed, the bird moved to another pole.

Simulations of virtual woodpecker communities with species having similar, different, or random drumming types, revealed that communities with distinct drumming types have an advantage compared to communities with similar types^{1,7,8}. Simulations also showed that the actual communities had performances with wide ranges from longer drumming to shorter drumming in behavioural similar response when compared to communities with randomly sampled species⁹. This suggests that acoustic discriminability is facilitated by a low number of species belonging to a given community, as well as by the use of distinct drumming types within that community⁹. However, this case may indicate the behavioural response of Japanese pygmy woodpecker to the removal of the trees. Moreover, similar

cases have been reported in Japan. A blog of June 2015 reported a similar behavior of a woodpecker on the telephone pole. The reported areas were located near urbanized cities^{22,23}.

This case finding may be attributed to several factors: proximity to urbanized areas within the Satoyama landscape, the height of the phone pole, and the personality of the observed Japanese pygmy woodpecker individual. However, the important fact of observations is that the woodpecker selected the phone pole, not a tree, on purpose to compare the sounds and chose the section of the metal plate, which created the highest-pitched tune. The bird visited the same pole at the same place each year, which shows the importance of this specific drumming activity for the individual, even more so after the removal of the cherry tree. Furthermore, the Satoyama landscape is a unique combination of urban areas, forests, and agricultural fields, which highlights a historical influence of deforestation. In this diverse landscape, several individuals of the Japanese pygmy woodpecker can coexist and they can select different drumming materials to display the territorial communication behaviour. Forest conservation (and management) is also an important factor for the health of individual tree¹⁰. Investigating and assessing the role of individual trees can indicate the characteristics of the specific regional forest and facilitate the research that assesses interspecies activity.

Japanese pygmy woodpeckers often visit the study area in pairs, and several birds can be residents of the area. The activity of Japanese pygmy woodpeckers reflects the characteristics of the Satoyama landscape. Therefore, deforestation and its impact must be considered for addressing landscape changes¹¹ because deforestation may force the birds to live in relatively small, anthropologically modified areas¹⁰. Consequently, the specific drumming observed in this study could also reflect stress behaviour. Moreover, based on the fact that the activity was observed in March and April, it could also represent a signal for male competition.

In conclusion, the present case study demonstrated the unique drumming behaviour of a Japanese pygmy woodpecker. The woodpecker displayed a preference of high-pitched sounds by drumming on different sections of a metal plate on top of a phone pole. This means that landscape diversity can also translate into behavioural diversity in addition to species diversity. Although, the number of successful recordings of this unique behaviour was limited, the specific drumming was observed at the same location throughout the research period.

The author assumes that the observed drumming activity represented play instead of communication behaviour because the woodpecker seemed to playfully explore the different sound qualities of the metal plate. However, this behaviour is likely to be linked to the environmental degradation in the study area due to tree removal and housing development. The behaviour of the bird reflects that the sustainability of the Satoyama region is facing a crisis. Consequently, the implementation of environmental restoration programmes in the Satoyama area is of urgent importance. Such programmes should involve landowners and other stakeholders and must be supported by efficient policies. Moreover, further research on intra-specific drumming behaviours of woodpeckers is required to connect the individual behaviour and degraded natural landscape.

In the last few decades, many Satoyama regions have been destroyed and various species have become extinct. The removal of trees, fields, and forest has been justified using the idea of economic development and assumption that the species may survive elsewhere, and hence, massive cumulative impact may not occur²⁸⁻³⁹. Furthermore, calculations or considerations regarding the effect of deforestation on “individuals” have not been conducted or are highly underestimated.

Today, conventional economic recovery focus on capital investment, increasing traffic, higher income, and infrastructure investment. However, green recovery includes individuals, which implies that no individual should be left behind.

The key to efficient green recovery may not be only action in large scale. One individual case, one change in activity, one incidence of tree cutting, and one region field, or Satoyama must be considered in the context of recovery. Individuals must collaborate with other individuals who study different species, work in different regions, or focus on different activities. Non-conventional research and policies should focus on “one” or individual, which implies that we remember and list what we lost and restore them accordingly. This may start with recovering one.

Methods

Study area

From April 2013 till June 2021, observations were conducted in the Furusawa forest of Asao Ward, Kawasaki, Kanagawa Prefecture, Japan; approximately 20 km from central Tokyo (Extended Data Figure 1). The forest belongs to the sustainable Satoyama area, which consists of both woodland and agricultural fields. The forest types in the Satoyama are coniferous, deciduous broadleaf, and mixed, and exhibit managed, natural, and mixed degrees of naturalness. The areas surrounding the sustainable Satoyama are urbanised. The Furusawa forest is adjacent to the Kurokawa area, the last valuable green area with biological diversity in the Tokyo-Kanagawa prefectural border area.

The fixed observation point was located in Hirao, Inagi City (Extended Data Figure 1). In this area, the Japanese green woodpecker (*Picus awokera*), lesser cuckoo (*Cuculus policephalus*) northern goshawk (*Accipiter gentilis*), and Japanese pygmy woodpecker are often observed. Some woodpecker species can be found throughout the year. At the observation point, a phone pole was located next two big trees, a hackberry tree (*Celtis sinensis var. japonica*) and a cherry tree (*Prunus spp*), on opposite sides of the road. Near the pole was also a dogwood tree (*Cornus brachypoda*) with many holes excavated by Japanese pygmy woodpeckers and Japanese green woodpeckers. This was also the case for the hackberry tree (Extended Data Figure. 2) In 2018, the trees in the observation area were cut down due to housing development. The hackberry tree is the food tree for great purple emperor (*Sasakia charonda*) and two-striped green buprestid (*Chrysochroa fulgidissima*).

Drumming behaviour observations and recordings

Daily observations, from 6:30 AM till 7:30 AM, were conducted throughout the study period. Whenever possible, the drumming behaviour of a Japanese pygmy woodpecker was recorded in a video. Recordings of behavioural activities have the advantage of comparing specific individual behaviours without introducing bias in the observation results. Interestingly, the Japanese pygmy woodpecker could not be found on rainy days.

Data availability

All of the data generated or analysed during this study are included in this article (and its references).

Declarations

- Ethics approval and Consent to participate

This study did not involve human participants. Maps in this study are publicly available. Therefore, the author did not need any ethical approval.

- Consent for publication

Not applicable

- Availability of data and materials

All of the data generated or analysed during this study are included in this article (and its references).

- Competing interests

The author has no competing interests to declare.

- Funding

Not applicable

- Authors' contributions

Setsuko Onoda, Ph.D. (only one author), Fixed point observation, Recording, Taking photographs, Organizing data, and Writing entire manuscript.

- Acknowledgements

- Authors' information (optional)

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Figures

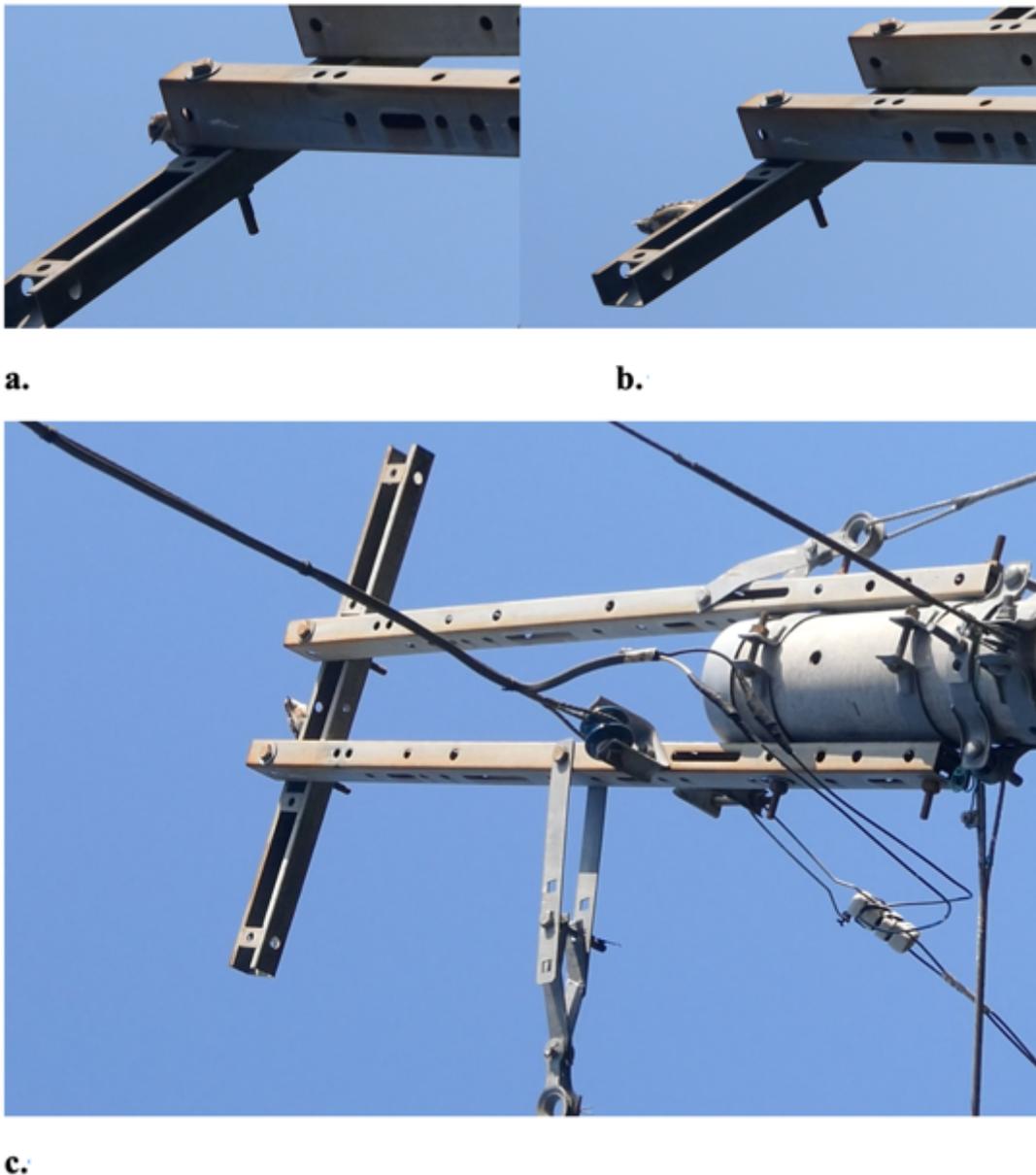


Figure 1

observed Japanese pygmy woodpecker individual drumming on the phone pole. **a**, The bird drumming at the point of the metal plate with the highest sound. **b**, The bird drumming the plate part which created a low-pitched sound, and **c**, drumming the part with high-pitched sound. The photos were extracted from the video recorded on 11 April 2020, 7:19 AM.

Supplementary Files

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