

## Unlocking the Secrets of Bird Conservation through Ringing: A Review

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Article History	Abstract
<p>Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 23 Nov 2023</p> <p>CC License CC-BY-NC-SA 4.0</p>	<p><i>Bird ringing, a widely employed technique for marking and studying birds, plays a crucial role in bird conservation. As the human population increases and natural habitats are threatened, birds face numerous challenges that necessitate effective conservation efforts. This paper examines the significance of bird ringing in gathering vital data for conservation and outlines the process and benefits of this technique. Bird ringing provides essential information for understanding bird populations and their behaviours. By capturing and marking birds, researchers can collect data on demographics, habitat usage, feeding patterns, and breeding seasons. Advanced techniques, such as radio-labelled rings, enable tracking of bird movements and migration routes. Through ringing, researchers can examine diseases, assess the presence of microorganisms that may impact both bird and human health and contribute to the understanding of bird-related biosecurity. The process of bird ringing involves careful capture and handling of birds using various techniques tailored to different species and habitats. Rings made of appropriate materials are applied to the birds for identification purposes. Thus, bird ringing is valuable for gathering critical data on bird populations, behaviour, and health, contributing significantly to bird conservation and sustainability. By providing insights into migration patterns, habitat usage, and health status, bird ringing enables conservationists to make informed decisions and implement effective measures to protect bird species and their habitats. Continued research and collaboration in the field of bird ringing are essential for the long-term preservation of avian biodiversity and the maintenance of healthy ecosystems.</i></p> <p><b>Keywords:</b> Ringing, Conservation, Anthropogenic activity, natural resources</p>

### 1. Introduction

The increasing human population is the major cause of habitat depletion for other organisms in the earth. Most of the wild organisms are adversely impacted for this reason. The sustainability of human life on earth also depends on nature and natural resources, thus scientific preservation or conservation of natural resources is the responsibility of humans. Birds are widely impacted due to habitat loss, deforestation, urbanization, and pollution caused by humans and natural disasters. To conserve any species or group of species, it is essential to gather huge and differential data on them. Demographic data, location of habituation, feeding habitat, and mating season are the essential data types needed for bird conservation (Evans et al., 1999). The ringing of birds is one of the easiest and most effective tools for gathering all this information. In advancement, the use of radio-labelled rings has upgraded the ringing tool to trace bird movements. Migratory birds are well studied with radio-labelled rings, and these tools track their flying path very well. Thus, radio trafficking and data generated by this tool are well-recognized for bird conservation (Baillie et al., 2009). Bird ringing tools have several data types, such as the life cycle of birds, and biological measurements such as length, weight, claw number and size, etc. Through this process, the disease of birds is also examined. In a broader sense, birds' health is also studied through the ringing process. Bird carrying microorganisms that may be able to cause disease in humans are also studied by the ringing process (Abulreesh et al., 2007). Birds are essential organisms for nature and the food web; they are prey of several pest organisms that are harmful to human development and agriculture. While poaching of birds is one of the main causes for their depleted

numbers in the wild. For all these reasons conservation of birds is essential, and proper awareness programs and rules by legislation should be taken. Through this review paper, we are trying to elaborate on the conservation process of birds that may upregulated by bird ringing and respective data. Additionally, the ringing of birds is a hundred years or more older tools, but at the beginning of these tools, it is mainly used for showing mastery (Anderson & Green, 2009). Estimation of the abundance of birds in a geographical region is also calculated by the tool bird ringing.

### **Study of Movement and Migratory behaviour of birds through Ringing**

Birds are free mover in nature; they fly high in the sky to show their different activities as well as their feeding, nesting, and other activities. In natural conditions, their movement between different places indicates the presence or absence of natural resources as well and they act as biomonitor organisms (Egwumah et al., 2017). Differential bird movements are previously addressed by many authors, such as they move in search of food, shelter, or other resources. The breeding population of the migratory bird is well described from the data obtained from the ringing process (Burfield, 2002). The previous author mentioned that when migratory birds are moved for their mating and breeding purpose, they are ringed while, when they are moved back, counting of non-ringed birds give an estimated count of their breeding success. Bird ringing is an efficient process for collecting data, required for bird conservation, but the process of bird ringing is a crucial and sophisticated work; it needs a professional hand for ringing (McCulloch et al., 1992). Migratory birds are most vulnerable due to poaching and illegal hunting, so efficient data of their movement and region of poaching is essential for their conservation (Clark, 2009; Baillie et al., 2007). They recorded the data from recovered, as these birds were ill or trapped by hunters. The movement of birds for mating is an essential topic of research, and bird ringers act as a collection of bird samples for genetic and molecular study, which ensures the genetic diversity of birds (Sharp, 2009). Rather than the study of movement breeding behaviour of birds was also studied through the ringing, and it was also found that due to climate change breeding season of birds was changed (Baillie et al., 2009). To gather information about the bird movement as well as their mating behaviour, ringing is an essential tool, and it is applicable for their better conservation.

### **Process of Bird ringing**

Bird ringing is a multistep process and it required efficiency, or the people involved in this process. According to De Beer and team (2000), different bird species need differential modes of ringing, depending on their habitat, as some of them are land dwellers while others are perambulating in trees and sky. Regarding the food habit, ringers also choose the correct place or mode of ringing. The first and most crucial step of the bird ringing is the capture of birds; it is a very delicate and sophisticated job, which required professional ringers. For the capture of bird, different types of traps are used such as Mist nets, this type of nets are used to capture the target bird that has a high abundance (Appleton, 1999; Brown & Oatly, 1971). Shorebirds are captured by using the Cannon nets, while kingfishers are captured by Clap trap. Night dwellers, such as owls, are captured and studied differently; they are captured by the Night-lighting technique. While sea birds are captured by using a modified hoop-net because the environmental condition of the sea is totally different from the terrestrial environment. The most important element of the ringing is the Rings which are used for the whole study, the classification of these rings are depends on the ring material; means the element with which the rings are made up, and the colour of the rings. Most of the rings are made up of metal while sometimes plastics are also used to make the rings (Demongin, 2016). As aluminium is a very lightweight metal, most of the rings are made up of it, but in some perspectives, aluminium is disadvantageous, such as large size and long-lived birds can easily break it. Despite aluminium alloy of magnesium and manganese are also used is lightweight as well as harder than aluminium. Rings must be colourless or less attractive because attractive colours may attract the predator, which is disadvantageous for the ringing scheme.

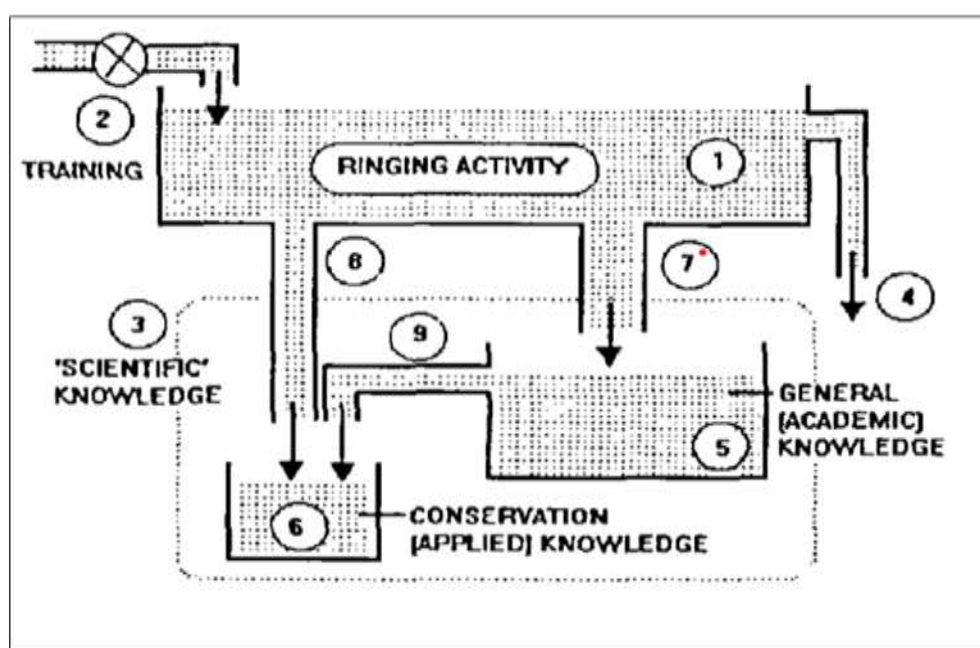
### **Bird Care at the time of Ringing**

Bird capture is an essential task for ringing; at the same time, it is a very crucial job and have a high risk of bird injury. From the start of the bird capture, the ringers need to be present near the nets, and after the completion of the capture, the whole set of nets needs to be removed, otherwise, it may hamper the non-targeted birds in the absence of ringers. Immediately after the birds are trapped in nets they must be recovered and held in a cage, bird bags, or in keepers. It may help to reduce their stress level and make it easier for ringers to study their morphology. They are held in different types of cages depending on their body size. If any bird is found to be injured or ill, they must be sent to the bird care centre for their treatment, and after their recovery, they will be left at the same place from where they were captured. When they are ringed, the size of the ring is very important factor, as well as the size and age of the bird also another important factor. Along with bird care, anthropogenic care is also very

important. The body of the birds provided an ideal environment for the growth of different types of microorganisms. These microorganisms are sometimes detrimental to human health; in other words, these directly impact the Ringer. Due to the migration of migratory birds, these microorganisms are also included in new regions, which may cause health issues in other birds as well as humans.

### Importance of bird ringing in bird conservation and sustainability

With reference to the previously stated causes, birds are threatened by anthropogenic activity and other natural calamities. Birds are considered the indicator species; their presence or absence signifies the quality of nature and natural resources. Pollution levels or other natural parameters are also determined by the abundance of the birds. Thus, the Conservation of birds is essential, and the ringing of birds is a major tool for this. Several information is required to make proper decision regarding bird conservation (Stephen et al., 2009). Spina, (1999) stated the importance of bird ringing in Europe, and according to the author to sustain the bird population in Europe in the future, their present information is important. Meanwhile, gathering present knowledge depends on the Bird ringing. Evans et al. discussed a scientific model named as “Hydraulic model” of information contribution through bird ringing. These models very well specify the role of ringers and the ringing tool in their conservation. Rather than these for any particular species, ringing a sufficient no of individuals in a specific area may be able to acquire sufficient data for their conservation.



**Fig 1:** Hydraulic model. Describing the ways Ringing is involved in bird conservation.

(1) denotes the ringing process done by trained ringers and gathering raw data. (2) Describing the training of new trainees by the trained ringers to increase the manpower. (3) it denotes the whole scientific knowledge obtained from the raw data gathered by the ringers. (4) some of the data acquired by the ringers are not used act as waste. (7) denotes the discussion and study on the preliminary data in academic institutions, while (8) states the use of data purely for the conservation purpose. (9) states that some conclusion from the academic institutes are used for the bird conservation. (6) it is the discussion making phase where after all the discussion, proper measures are taken regarding the bird conservation.

**Source:** Evans, A.D., Gosler, A.G. and Wilson, J.D., (1999).

With the ringing, the singing of birds is also an important aspect to study the behaviour of birds which in turn helps in their conservation. For the study of bird songs, the role of the Ringer is again required, at the same time, a trained ringer studies the birds singing as well as rings them to gather a huge bunch of information about the birds (Baillie & Wernham, 1999). Birds sing for two reasons first one is to attract the mating partner, and the other one is to specify their territory.

### 4. Conclusion

In conclusion, bird ringing plays a crucial role in bird conservation and sustainability efforts. By gathering data on various aspects of bird behaviour, such as movement, migratory patterns, breeding, and health, bird ringing provides valuable information for understanding and protecting bird

populations. The ringing process involves multiple steps, from the delicate capture of birds using different trapping techniques to the selection and application of rings. Professional ringers employ specific methods depending on the species and habitat of the birds. Careful handling and bird welfare measures are essential during the capture and ringing process to minimize stress and potential injuries. Bird ringing contributes to bird conservation by enabling the collection of vital data for decision-making. The data obtained through ringing efforts help assess population abundance, study movement patterns, monitor breeding success, and analyse the impact of anthropogenic activities and natural disasters on bird populations. Additionally, ringing plays a role in genetic and molecular studies, ensuring the preservation of genetic diversity among bird species. The significance of bird ringing extends to its contribution to scientific knowledge and ecological understanding. By examining the collected data, researchers and conservationists gain insights into the health of ecosystems, as birds act as bio-indicators and can reflect the quality of the environment. Moreover, bird ringing facilitates the study of bird songs, aiding in the analysis of behaviour, mating patterns, and territoriality. Overall, bird ringing is an invaluable tool for collecting comprehensive and differential data on bird species. Through the efforts of dedicated ringers and the utilization of ringing data, conservationists can make informed decisions to protect birds and their habitats, contributing to the preservation of nature and the well-being of both avian populations and human society.

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