

Avian Sensory Kit for Enhancing Accessible Avitourism for Visually Impaired Tourists in Kota Tinggi, Johor

Nurul Farisyah Mat Zaidi¹, Nor Atiqah Norazlimi^{12*}

¹ Department of Technology and Natural Resources, Faculty of Applied Sciences and Technology, UTHM Kampus Cawangan Pagoh, Hab Pendidikan Tinggi Pagoh, KM 1, Jalan Panchor, 84600, Pagoh, Muar, Johor, MALAYSIA.

² Environmental Management and Conservation Research Unit (eNCORe), Faculty of Applied Sciences and Technology, UTHM Kampus Cawangan Pagoh, Hab Pendidikan Tinggi Pagoh, KM 1, Jalan Panchor, 84600, Pagoh, Muar, Johor, MALAYSIA.

*Corresponding Author: atiqah@uthm.edu.my

DOI: <https://doi.org/10.30880/ekst.2025.05.02.075>

Article Info

Received: 30 December 2024 Year
Accepted: 25 January 2025 Available
online: 19 December 2025

Keywords

Avitourism, Birdwatching,
Visually Impaired Tourist

Abstract

Avitourism or birdwatching tourism has become an increasingly important subsector in ecotourism. Despite its popularity, avitourism has posed challenges to those with vision disabilities. To overcome these challenges, accessible avitourism was introduced to this study which aims to provide inclusive avitourism to visually impaired people. The study was conducted from early August to the end of August 2024 in selected areas of Kota Tinggi, Johor. The objectives of this study were to provide checklist of avian species present in selected areas of Kota Tinggi, Johor, develop an avian sensory kit to enhance the accessibility of the avitourism experience for visually impaired tourists in Kota Tinggi, Johor and to evaluate the effectiveness of the avian sensory kit for visually impaired tourists and local guides in Kota Tinggi, Johor. A total of 46 bird species were recorded and six species were selected for the kit development based on the criteria that highlighted their value as nature tourism products. An avitourism program was held in November 2024 to introduce the kit to visually impaired tourists. Positive feedback was received from the visually impaired tourists and stakeholders for the avian sensory kit indicating that this kit successfully improved the experience of visually impaired tourists in participating in this accessible avitourism program. Thus, this highlights the potential of accessible avitourism to promote social change by fostering inclusivity within the avitourism and broader tourism industry.

1. Introduction

Avitourism, also known as birdwatching or birding tourism is a recreational activity of observing and appreciating birds in their natural habitat [1], which offers recreational activities while contributing to the local economy and conservation efforts through habitats and biodiversity protection [2]. Areas with high biodiversity such as wetlands, forests, and coastal areas are focused on becoming avitourism destinations where various species of birds can be observed throughout the season and year [3]. Malaysia has recorded 824 bird species in the country and widely recognized as one of the best birds watching destination in South East Asia [4].

However, while avitourism has become more popular, tourism for the visually impaired remains a challenge, particularly in outdoor activities such as birdwatching. The World Health Organization estimated that at least 2.2 billion people worldwide to have a near or distant visual impairment [5]. Visually impaired individuals experience specific challenges in outdoor recreational activities such as avitourism due to their reliance on visual information

for participation, navigation, and observation. Avitourism involves observing birds in their natural habitats and using visual cues including colour, behaviour, and environment of birds [6]. As a result, integrating inclusive features into avitourism will open equal access to nature-based activities for visually impaired tourists

Bioacoustics, the study of the animal sounds can increase the accessibility of avitourism for the visually impaired tourists [7]. While traditional avitourism relies more on the physical appearance or morphology of birds, bioacoustics provides avitourism without the use of sight. The development of applications and audio guides to recognize and interpret bird sounds can be produced from bioacoustic technology. Researchers are increasingly using bioacoustic method to collect and analyze soundscapes [8]. This method is very useful in helping researchers to recognize and study the calls of different species. These advances could potentially be used in developing tools for visually impaired tourists to participate in avitourism through bioacoustic method.

Kota Tinggi Johor, Malaysia can become a new avitourism destination, which will allow assessing the effectiveness of the bioacoustics in enhancing the accessibility for the visually impaired tourists. Bioacoustic technology that will function as an auditory signal of bird sites as well as a description of bird species in Kota Tinggi, Johor can be applied to developed avitourism products such as avian sensory kits that allow visually impaired tourists to engage in avitourism. Therefore, by using this method, destinations such as Kota Tinggi, Johor can contribute to the principle of barrier-free tourism so that all tourists can enjoy the wonders of nature in this region regardless of their abilities.

Therefore, this study aims to provide checklist of avian species present in selected areas of Kota Tinggi, Johor, develop an avian sensory kit to enhance the accessibility of the avitourism experience for visually impaired tourists in Kota Tinggi, Johor and to evaluate the effectiveness of the avian sensory kit for visually impaired tourists and local guides in Kota Tinggi, Johor.

2. Research Methodology

2.1 Study Site

Tanjung Belungkor, Pulau Tanjung Surat and Kampung Tanjung Serindit are situated in the district of Johor which is situated to the south east of Malaysia. All these areas are having different coastal features such as mangroves, beaches, tidal mudflats and lowland forests that are found at an altitude of up to 9 meters above sea level. The climate of these three sites across these countries is tropical with high average temperature regime of 27-33 °C and average annual precipitation of between 2500-3000 mm. Social cultural of these regions are involved with many local people that involved in fishing, and produce handmade items, and local seafood. Fig. 1 illustrates the study site that consists of Tanjung Belungkor, Pulau Tanjung Surat, and Kampung Tanjung Serindit of Johor Kota Tinggi.

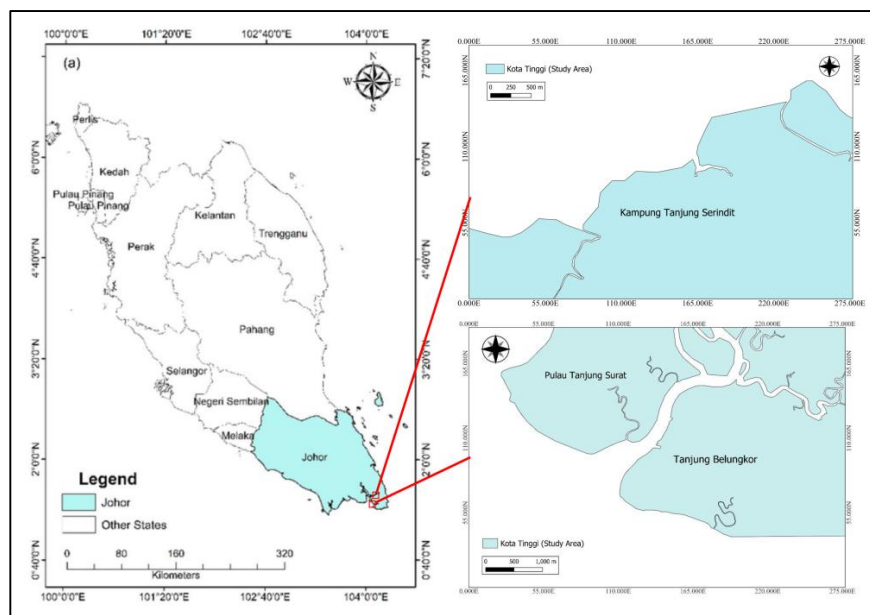


Fig. 1 The location of the study area

2.2 Methodology

The study was conducted from early August to the end of August 2024. A combination of bioacoustics using BirdNET application and visual observation using binoculars and a DSLR camera was used to document bird species in the study area. The encountered birds were identified using a field guide book [9], eBird and MyBIS databases. By combining these methods, the study offered a comprehensive dataset, including a range of avian species, revealing the importance of the advanced technologies and conventional methods of field observation.

Next, the avian sensory kit was developed to make avitourism more accessible to visually impaired tourists by stimulating the tactile and auditory senses through six tactile models of birds found in the study areas. The models were made using wire frames and several layers of paper focusing on bird's morphological characteristics including varied beak shapes and feet to highlight their ecological roles. The kit was also complemented with sound recording to allow the tourists to identify birds by their calls. Lastly, the avian sensory kit was stored in a protective transparent box, providing an inclusive and interactive tourist package.

An avitourism program was conducted with visually impaired people and stakeholders such as a tourist guide and residents to introduce avian sensory kits. A structured questionnaire and interviews were conducted to evaluate the effectiveness of the developed bird sensory kit. The questionnaire consisted of three parts. Part A collected demographic information such as age, gender, level of visual impairment, and previous avitourism experience to understand how these factors influenced perceptions of the sensory kit. Part B evaluated participants' knowledge about birds. Part C assessed the avian sensory kit, while Part D gathered feedback on participants' experiences with the developed sensory kit, including its usability, appeal, and impact on their overall avitourism experience. The questionnaire was read aloud to gather feedback from visually impaired tourists.

3. Results and Discussion

3.1 Checklist of Bird Species in Kota Tinggi, Johor

A total of 46 bird species were identified and recorded based on sound and observation across three distinct areas in Kota Tinggi specifically at Tanjung Belungkor, Pulau Tanjung Surat and Kampung Tanjung Serindit. The summary of the recorded species is listed in Table 1.

Table 1 Checklist of Bird Species in Kota Tinggi, Johor

No.	Species Name	Common Name	Local Name	Distribution status	IUNC Status
1.	<i>Haliastur indus</i>	Brahminy Kite	Helang Merah	R	LC
2.	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	Helang Laut	R	LC
3.	<i>Aegithina tiphia</i>	Common Iora	Kelicap Kunyit	R	LC
4.	<i>Todiramphus chloris</i>	Collared Kingfisher	Pekaka Bakau	R	LC
5.	<i>Halcyon smyrnensis</i>	White-throated Kingfisher	Pekaka Dada Putih	R	LC
6.	<i>Ardea cinerea</i>	Grey Heron	Pucung Kelabu	R	LC
7.	<i>Egretta garzetta</i>	Little Egret	Bangau Kecil	R	LC
8.	<i>Anthracoceros albirostris</i>	Oriental Pied Hornbill	Kelingking	R	LC
9.	<i>Chloropsis moluccensis</i>	Blue-winged leafbird	Daun Sayap Biru	R	LC
10.	<i>Mycteria cinerea</i>	Milky Stork	Botak Upeh	R	EN
11.	<i>Mycteria leucocephala</i>	Painted Stork	Botak Padi	V	LC
12.	<i>Orthotomus ruficeps</i>	Ashy Tailorbird	Perenjak Bukit	R	LC
13.	<i>Orthotomus atrogularis</i>	Dark-necked tailorbird	Perenjak Belukar	R	LC
14.	<i>Ducula aenea</i>	Green Imperial-Pigeon	Pergam Hijau	R	LC
15.	<i>Streptopelia chinensis</i>	Spotted Dove	Tekukor	R	LC
16.	<i>Treron sphenurus</i>	Wedge-Tailed Green-Pigeon	Punai Bukit	R	LC
17.	<i>Corvus splendens</i>	House Crow	Gagak Rumah	I	LC

18.	<i>Phaenicophaeus tristis</i>	Green-billed Malkoha	Cenuk Besar	R	LC
19.	<i>Phaenicophaeus curvirostris</i>	Chestnut-Breasted Malkoha	Cenuk Birah	R	LC
20.	<i>Centropus bengalensis</i>	Greater Coucal	Bubut Kecil	R	LC
21.	<i>Dicaeum trigonostigma</i>	Orange-bellied Flowerpecker	Sepah Puteri Bukit	R	LC
22.	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Pipit Pinang	R	LC
23.	<i>Hirundo tahitica</i>	Pacific Swallow	Layang-layang Pasifik	R	LC
24.	<i>Sternula albifrons</i>	Little Tern	Camar Kecil	R	LC
25.	<i>Motacilla cinerea</i>	Grey Wagtail	Pipit Batu	M	LC
26.	<i>Copsychus saularis</i>	Oriental magpie-robin	Murai Kampung	R	LC
27.	<i>Copsychus malabaricus</i>	White-rumped Shama	Murai Batu	R	LC
28.	<i>Muscicapa dauurica</i>	Asian brown flycatcher	Sambar Asia	R	LC
29.	<i>Aethopyga siparaja</i>	Crimson Sunbird	Kelicap Sepah Raja	R	LC
30.	<i>Cinnyris jugularis</i>	Olive-backed Sunbird	Kelicap Bukit	R	LC
31.	<i>Butorides striata</i>	Striated heron	Pucong Keladi	R	LC
32.	<i>Pellorneum rostratum</i>	White-chested Babbler	Rimba Telunjuk	R	NT
33.	<i>Phylloscopus borealis</i>	Arctic warbler	Cekup Arctik	M	LC
34.	<i>Yungipicus moluccensis</i>	Sunda Pygmy Woodpecker	Belatuk Belacan	R	LC
35.	<i>Dinopium javanense</i>	Common Flameback Woodpecker	Belatuk Emas	R	LC
36.	<i>Pycnonotus brunneus</i>	Asian Red-eyed Bulbul	Merbah Mata Merah	R	LC
37.	<i>Rubigula erythroptalmos</i>	Spectacled Bulbul	Merbah Kecil	R	LC
38.	<i>Pycnonotus simplex</i>	Cream-vented Bulbul	Merbah Mata Putih	R	LC
39.	<i>Pycnonotus goiavier</i>	Yellow-vented Bulbul	Merbah Kapur	R	LC
40.	<i>Pycnonotus plumosus</i>	Olive-winged Bulbul	Merbah Belukar	R	LC
41.	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	Ruak-ruak	R	LC
42.	<i>Rhipidura javanica</i>	Malaysia pied fantail	Sambar Murai Gila	R	LC
43.	<i>Aplonis panayensis</i>	Asian Glossy Starling	Perling Mata Merah	R	LC
44.	<i>Acridotheres javanicus</i>	Javan Myna	Tiong Jawa	IN	LC
45.	<i>Acridotheres tristis</i>	Common Myna	Tiong Gembala Kerbau	R	LC
46.	<i>Mixornis gularis</i>	Pin-striped Tit-Babbler	Rimba Berjalur	R	LC

*Note: R=Resident; M=Migrant, V=Vargant; IN= Invasive, LC= Least Concern, NT= Near Threatened; EN=Endangered

Of 46 species recorded, two species were classified as threatened according to the IUCN Red List of Threatened Species which are Milky Stork (*Mycteria cinerea*), which is categorized as Endangered, and White-chested Babbler (*Pellorneum rostratum*), which is classified as Near Threatened. Furthermore, two migratory species were recorded, Grey Wagtail (*Motacilla cinerea*) and Arctic Warbler (*Phylloscopus borealis*), which points to the significance of these areas of the migratory flyway in the region.

The high bird species observed in Kota Tinggi therefore creates high potential for ecotourism in the area. Research indicates that that the level of ecological diversity of Pulau Tanjung Surat is important in the development of ecotourism since it can provide different experiences for tourists [10]. Bird species, which can be easily recognized, as well as their voices, like Oriental Pied Hornbill (*Anthracoceros albirostris*) or the endangered species such as Milky Stork, are crucial for birdwatching tourism. The availability of these species in areas easily accessible such as Tanjung Belungkor and Kampung Tanjung Serindit can become a possible ecotourism site.

Ecotourism plays a crucial role in promoting habitat conservation by generating financial incentives for protecting these ecosystems. Local people could develop business out of other activities such as bird watching, home stay and any other environmentally friendly activities such as construction of eco-tourism related facilities. For example, ecotourism has been used in development of employment and boosting the economy of those surrounding areas to improve living standards but also for conservation efforts. Additionally, ecotourism

programs can help increase the public's knowledge of bird species and increase community engagement in the preservation of these critical environments for a long time. It has been proved in various research that ecotourism leads to people obtaining knowledge regarding varieties of species of plants and animals as well as encouraged them to participate in environmental conservation [11].

3.2 Development of an avian sensory kit

Based on the overall data of this research, six bird species were chosen to be used in developing the product which reflects the diversity of habitats, diets, and ecological roles within the ecosystem of the research area. The species are Oriental Pied Hornbill (*Anthracoceros albirostris*), Crimson Sunbird (*Aethopyga siparaja*), Flameback Woodpecker (*Dinopium javanense*), White-breasted Waterhen (*Amaurornis phoenicurus*), White-throated Kingfisher (*Halcyon smyrnensis*) and White-rumped Shama (*Copsychus malabaricus*).

The development of the avian sensory focused on designing tactile replicas of birds, combined with auditory elements to enhance access for visually impaired tourists. These replicas were made from lightweight wire frames, recycled materials, and air-dry clay to ensure realism, sturdiness, and eco-friendliness. Such features as beaks, feathers, and legs were crafted with care to reproduce the unique morphological characteristics of the birds. Textures and patterns, as in the elongated legs of the White-breasted Waterhen and the curved beak of the Oriental Pied Hornbill, gave hands-on clues for learning to differentiate between species. Most mounts were placed on bases meant to mimic natural environments further assisting the senses.

Auditory components included high-quality recordings of avian calls and songs, downloaded from trusted online resources and edited for maximum clarity. These auditory materials were embedded in portable audio devices with user-friendly controls, allowing visitors to explore the avian soundscape in parallel with the tactile models. Taken together, the avian models and sounds created an integrated, accessible educational tool that highlighted the species' morphological features, behaviours, and ecological roles, thus fostering a deeper engagement with nature for participants who are visually impaired or have low vision. Fig 2 shows the avian sensory kit developed in this study.



Fig. 2 The avian sensory kit developed in this study

3.3 Evaluation of the effectiveness of the avian sensory kit

The Avian Sensory Kit was a product aimed at improving avitourism for the visually impaired tourists. The kit aims to provide an accessible way for visually impaired tourists to engage in birdwatching activities through sensory elements such as tactile models of birds and corresponding audio recordings of bird sounds.

A hands-on program was organized to demonstrate the kit to the visually impaired tourists to assess its effectiveness and get their feedback about the product. The program was held on 6th November 2024 and was co-organized by Tourism Planning Research Group (TPRG), University Teknologi Malaysia (UTM) in collaboration with Blerong Services, the organizer of the program 'Accessible Geotour: Voluntourism Experience with Blerong' to ensure a comprehensive approach to observe an extensive method of creating awareness and promoting Avitourism.

The program was attended by participants from Universiti Tun Hussein Onn Malaysia consisting of two lecturers, four students as facilitators, and two students as participants of this program. Additionally, 10 participants from the Society of The Blind in Malaysia (SBM) and a local community. At the end of the program, a

structured questionnaire was distributed to the eight-person of visually impaired tourists to gather their feedback for the avian sensory kit developed. The questionnaire was read to them, and their feedback was recorded directly during the session. Besides, feedback was also gathered from other stakeholders such as a local guide and resident.

3.3.1 Feedback from Visually Impaired Tourists

A total of 8 participants answered the questionnaire, providing a variety of viewpoints and invaluable insights for this study. The demographic profile offers a thorough overview of the visually impaired tourists participating in Avitourism program. The demographic consisting of gender, race, level of impairment and previous experience in participating in avitourism activities are shown in Table 2.

Table 2 Demographic Respondents

Survey	Answer Option	Frequency	Percentage
Gender	Male	3	63%
	Female	5	37%
Age	21-30 years	-	-
	31-40 years	3	37%
	41-50 years	2	25%
	51 years and above	3	38%
Race	Malay	6	75%
	Chines	-	-
	Indian	2	25%
Level of Visual Impairment	Others	-	-
	Level 1	4	50%
	Level 2	22	25%
Previous experience in participating in avitourism activities	Level 3	25%	
	Yes	3	37%
	No	5	63%

Several questions were asked in the questionnaire regarding the knowledge about birds. The results are shown in Table 3.

Table 3 An analysis of questions on knowledge about birds among respondents

Question	Total Number		
	Yes	No	Not Sure
Do you know about birds?	4	3	1
Do you know that birds can fly?	8	-	-
Do you know that birds are the only animals that have feathers?	5	3	-
Do you know that birds migrate according to the seasons?	5	3	-
Do you know that the shape of a bird's beak is related to its diet?	4	3	1
Do you know that birds have different sounds for different purposes?	6	2	-
Do you know that some birds can mimic the speech of humans?	7	1	-
Do you know that birds have various types of feet adapted to their lifestyles?	4	4	-

Several questions were asked in the questionnaire regarding the feedback on the Avian Sensory Kit. The results are shown in Table 4.

Table 4 An analysis of questions on knowledge about feedback avian sensory kit

Question	Total Number				
	SD	D	UN	A	SA
The sensory kit makes avitourism activities more enjoyable.	-	-	-	2	6
The bird sensory kit is effective in conveying information about birds.	-	-	-	2	6
Using the bird sensory kit enhances my ability to identify bird calls.	-	-	1	3	4
The tactile elements of the bird sensory kit help in understanding the anatomy of birds.	1	-	-	2	5
The bird sensory kit effectively enhances my sense of touch in exploring bird-related textures.	-	-	-	2	6
The bird sensory kit increases my curiosity about bird behaviour.	-	-	-	1	7
I find the bird sensory kit to be a valuable resource for learning about birds.	-	-	-	1	7
I feel more confident in my ability to participate in avitourism activities with the bird sensory kit.	-	-	-	1	7

*Note: SD=Strongly Disagree; D=Disagree; UN=Uncertain; A=Agree; SA=Strongly Agree

3.3.2 Feedback from other stakeholders

The program also involved other tourists and stakeholders which consisted of one local tourist guide, two volunteer companions from the Society of Visually impaired People Malaysia (SBM), three primary school teachers and one resident. The same questionnaire was also distributed to them to gather their feedback on this avian sensory kit. The involvement of participants with normal vision provides additional validation to the designed sensory kit's design and usability. The gathered feedback aligns with visually impaired participant insights to validate the intended purposes of the kit.

Table 5 Demographic Respondents

Survey	Answer Option	Frequency	Percentage
Gender	Male	5	71%
	Female	2	29%
Age	21-30 years	-	0%
	31-40 years	2	28%
	41-50 years	3	43%
	51 years and above	2	29%
Race	Malay	7	100%
	Chines	-	-
	Indian	-	-
	Others	-	-
Level of Vision	Normal	7	100%
	Visually Impaired	-	-

Previous experience in participating in avitourism activities	Yes	2	29%
	No	5	71%

Several questions were asked in the questionnaire regarding the knowledge about birds. The results are shown in Table 6.

Table 6 An analysis of questions on knowledge about birds among respondents

Question	Total Number		
	Yes	No	Not Sure
Do you know about birds?	7	-	-
Do you know that birds can fly?	7	-	-
Do you know that birds are the only animals that have feathers?	5	-	2
Do you know that birds migrate according to the seasons?	6	-	1
Do you know that the shape of a bird’s beak is related to its diet?	5	2	-
Do you know that birds have different sounds for different purposes?	6	-	1
Do you know that some birds can mimic the speech of humans?	7	-	-
Do you know that birds have various types of feet adapted to their lifestyles?	6	-	1

Several questions were asked in the questionnaire regarding the feedback on the Avian Sensory Kit. The results are shown in Table 7.

Table 7 An analysis of questions on knowledge about feedback avian sensory kit

Question	Total Number				
	SD	D	UN	A	SA
The sensory kit makes avitourism activities more enjoyable.	-	-	-	1	6
The bird sensory kit is effective in conveying information about birds.	-	-	-	1	6
Using the bird sensory kit enhances my ability to identify bird calls.	-	-	-	2	5
The tactile elements of the bird sensory kit help in understanding the anatomy of birds.	-	-	-	3	4
The bird sensory kit effectively enhances my sense of touch in exploring bird-related textures.	-	-	-	2	5
The bird sensory kit increases my curiosity about bird behavior.	-	-	-	1	6
I find the bird sensory kit to be a valuable resource for learning about birds.	-	-	-	1	6
I feel more confident in my ability to participate in avitourism activities with the bird sensory kit.	-	-	-	2	5

*Note: SD=Strongly Disagree; D=Disagree; UN=Uncertain; A=Agree; SA=Strongly Agree

3.3.3 Evaluation of the Design and effectiveness of the Avian Sensory Kit from the perspective of local tourist guide

For the evaluation of the avian sensory kit’s design, the questionnaire was distributed to a local guide, Mr. Mohd Effendy Yusof, aiming to gather their feedback on the attractiveness of the avian sensory kit as a tourism product. Table 4.5 shows the feedback of the questionnaire.

Table 8 An analysis of questions on feedback from a local tourist guide on the design of the avian sensory kit

Question	Answer Option		
	Yes	No	Not Sure
Is the design of this bird sensory kit attractive and easy to understand?	/		
Is this kit easy to use for individuals without a background in bird studies or avitourism?	/		
Does this bird sensory kit provide enough sensory variety to capture users' attention?			/
Do you feel this kit is suitable for users with special needs, such as the visually impaired?	/		
Is the design of this kit suitable for use in various environments such as schools, tourist centres, or museums?	/		
Do you think this bird sensory kit can provide high educational value in the long term?	/		
Do you think this bird sensory kit could attract the interest of foreign tourists?			/
Does this bird sensory kit convey information about birds clearly and easily?	/		

Based on the data collected, it is evident that the bird sensory kit received positive feedback from the respondents. The design of the content was considered attractive and easy to understand by the participant according to the answer to the first question. Moreover, the kit was easily understandable even for those who have no background in bird-related research or avitourism. The respondent also agreed that the sensory kit provided enough different sensory stimuli to meet the user interest. Most importantly, they recommended it for use especially for persons with disabilities especially the visually impaired. The design was also recognized based on its suitability and applicability to different places including schools, tourist information centres and museums. The respondents agreed and recognized the educational purpose of the sensory kit with a potential long-term effect. Also, the respondent agreed that the kit had the ability to create interest from the foreign tourists. Finally, the clarity and comprehensibility of the information presented about birds were positively received.

The findings of this study may offer the possibility of encouraging positive social change due to the creation of appreciation for avitourism and other forms of tourism. Developing a sensory kit specifically for visually impaired tourists, it has the goal of enhancing and enabling visually impaired participants to engage in nature-based tourism. The evidence shows that visually impaired tourists encounter challenges which prevent proper tourism experience mainly due to physical surroundings arrangement and lack of staff education [12]. This could open an opportunity where members in this group can be able to engage in wildlife and nature experiences like other people hence enhancing their quality of wildlife and nature experience. Studies have shown that when sensory experiences are enhanced through tactile and auditory elements, visually impaired individuals can enjoy rich, rewarding experiences in tourism settings [13]. As a result, people may become more aware of biodiversity, hence develop better understanding of conservation practices. From an economic perspective, barriers to access for visually impaired tourists will stimulate the economic development and increased offering of inclusive tourism services.

4. Conclusion

The research achieved its objectives by providing a checklist of 46 avian species in selected areas of Kota Tinggi, Johor, developing an avian sensory kit to enhance avitourism accessibility for visually impaired tourists, and evaluating its effectiveness. Threatened species like the Milky Stork (*Mycteria cinerea*) and White-chested Babbler (*Pellorneum rostratum*) were documented, and the use of bioacoustic and visual methods highlighted the importance of conserving habitats for resident and migratory birds, emphasizing Kota Tinggi's ecological significance. The avian sensory kit, which allowed visually impaired tourists to experience birdwatching through touch and hearing, received positive feedback for enhancing accessibility and fostering conservation awareness. However, limitations included a single study area, covers only a limited bird species in the avian sensory kit, and a small sample size for evaluation. Despite these challenges, the study provides an avian sensory kit for inclusive tourism and underscores the importance of accessibility in ecotourism. Further research should be carried out on the application of the sensory kit to other biodiversity-rich areas, with more participant groups, and with the incorporation of real time bioacoustic technologies. Long-term studies on the impact of inclusive tourism on conservation awareness and sustainability are also recommended.

Acknowledgement

The authors would like to thank the Faculty of Applied Sciences and Technology, Universiti Tun Hussein Onn Malaysia, for its support. Also, sincerely thank the local authorities in Kota Tinggi, Johor, and the members of the community who helped during the fieldwork. Special thanks to Encik Fendy for his support and for providing ideas and guidance that helpful for this research.

Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm their contributions to the paper as follows: **study conception and design:** Nurul Farisyah Mat Zaidi; **data collection:** Nurul Farisyah Mat Zaidi; **analysis and interpretation of results:** Nurul Farisyah Mat Zaidi, Nor Atiqah Norazlimi; **draft manuscript preparation:** Nurul Farisyah Mat Zaidi, Nor Atiqah Norazlimi. All authors reviewed the results and approved the final version of the manuscript.

References

- [1] Gee, J. P. (2023). Avitourism: Trends and Opportunities in Wildlife Tourism. Routledge
- [2] Smith, L. J., Holmes, T. W., & Newsome, D. (2022). Understanding avitourist behaviour: A review of factors influencing birdwatching tourism. *Tourism Management Perspectives*, 37, 100866.
- [3] Goodale, E., Beauchamp, G., Magrath, R. D., Nieh, J. C., Ruxton, G. D., & Mettke-Hofmann, C. (2019). The origin of avitourism: What do we know and where should we be heading? *Journal of Ecotourism*, 18(1), 1-10.
- [4] De Waard, B. (2023). The ultimate guide to birdwatching in Malaysia. *Malaysian Wildlife*. Retrieved on May 25, 2024, from <https://malaysianwildlife.org/animal-species/the-ultimate-guide-to-birdwatching-in-malaysia/>
- [5] World Health Organization: WHO. (2023, August 10). Visually impairedness and vision impairment. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/visually-impairedness-and-visual-impairment>
- [6] Jones, D., & Brown, K. (2019). Challenges faced by visually impaired tourists in avitourism destinations. *Journal of Sustainable Tourism*, 37(4), 589-601.
- [7] Pijanowski, B. C., Farina, A., Gage, S. H., Dumyahn, S. L., & Krause, B. L. (2020). Advances in bioacoustics: From soundscapes to ecosystem services. *Trends in Ecology & Evolution*, 35(11), 943-957.
- [8] Stowell, D. (2018). Computational bioacoustic scene analysis. In Virtanen, T., Plumbley, M., & Ellis, D. (Eds.), *Computational analysis of sound scenes and events* (pp. 303-333). Springer, Cham. https://doi.org/10.1007/978-3-319-63450-0_11
- [9] Jeyarajasingam, A., & Pearson, A. (2012). *A field guide to the birds of Peninsular Malaysia and Singapore*. Oxford University Press.
- [10] Hazran, M. F. R., Shari, M. A., Majid, N. A., Jusoh, A. F. M., & Salleh, K. M. (2024). Developing ecotourism community-based approach: A sustainable tourism development project on Tanjung Surat Island. *Journal of Technical Education and Training*, 16(2). <https://doi.org/10.30880/jtet.2024.16.02.029>
- [11] Samal, R., & Dash, M. (2022). Ecotourism, biodiversity conservation and livelihoods: Understanding the convergence and divergence. *International Journal of Geoheritage and Parks*, 11(1), 1-20. <https://doi.org/10.1016/j.ijgeop.2022.11.001>
- [12] Obigbesan, E., Chapman, A., & Light, D. (2023). Positive experiences of visually impaired tourists. *Current Issues in Tourism*, 27(12), 1870-1883. <https://doi.org/10.1080/13683500.2023.2214722>
- [13] Richardson, J. (2024, March 11). Best practice in making museums more accessible to visually impaired visitors. *MuseumNext*. Retrieved from <https://www.museumnext.com/article/making-museums-accessible-to-visually-impaired-visitors/>