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Illegal trapping and local trade of farmland birds in Madhesh Province, Nepal

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ABSTRACT

Worldwide defaunation is being accelerated by wildlife hunting, trapping, and trade. However, there is little knowledge of bird hunting or trapping in South Asia, including Nepal. Despite being illegal, trapping and eating wild birds (locally called Bagedi, i.e., bunting species - small passerine birds that are declining globally) is popular in lowland Nepal. However, it has received little research interest. We identified the potential bird species that could be trapped under the name Bagedi. We also interviewed 24 trappers, 26 middlemen, 65 hoteliers, and 105 customers to understand the trapping, trade, and eating practices of Bagedi and the impacts on the farmland bird population in Madhesh Province, Nepal. By following trappers and middlemen and based on our Farmland Bird Survey Program in lowland Nepal, we identified 25 farmland bird species that are most likely to be trapped, killed, and sold in the name of Bagedi. We confirmed six of them including true buntings, such as Black-headed Bunting (Emberiza melanocephala), Crested Bunting (Emberiza lathami) and other similar-sized species like Scaly-breasted Munia (Lonchura punctulata) and Baya Weaver (Ploceus philippinus), among others. Trade in Bagedi has increased over the past ten years due to high prices and the customers' belief that consuming Bagedi produces heat in the body in winter and has aphrodisiac properties. Winter (December-February) is the peak Bagedi eating season and based on interviews with hoteliers (n = 55) during the survey period, we estimated that 115,200 to 129,600 birds were killed. During this period, the surveyed hoteliers would make an estimated business of around Nepalese Rupees 7488,000 to 8424,000 (USD 65,113–73,252). More than 70% of the people interviewed claimed that they did not know that trapping, trading, or eating wild birds is illegal. Around 50% of the trappers, 92% of the middlemen, 56% of the hoteliers, and 54% of the customers showed an unwillingness to stop this

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activity. Our study shows that bird trapping in our study area is highly market-driven and is a serious, understudied, and overlooked conservation threats to farmland birds in Nepal.

1. Introduction

Hunting is a major anthropogenic driver of declining wildlife populations across tropical and sub-tropical regions (Aiyadurai et al., 2010; Ingram et al., 2021; Milner-Gulland et al., 2003; Yong et al., 2022), even leading to extinctions (Bennett et al., 2002; Wilkie et al., 2011). Of two hunting types, subsistence hunting is mainly practiced by indigenous/local people to consume wild meat for protein or small trade at local markets for daily livelihood (Ahmed, 1997; Suarez and Zapata-Rios, 2019; Wilkie et al., 2011; Yong et al., 2022). Commercial hunting (for trade) is performed on a large scale and targets specific species to fulfill the demand of the regional and global markets due to high prices. For example, rhinoceros (*Rhinoceros* spp.) horn, elephant (*Elephas* spp.) ivory, musk (*Moschus* spp.), tiger (*Panthera* spp.) bone, and pangolins (*Manis* spp.) are all widely traded species (Antunes et al., 2016; Greengrass, 2016; Sharma et al., 2020). Due to the selection of a wider variety of species, subsistence hunting may not pose a higher threat than commercial hunting; however, market-driven subsistence hunting has increased over the past 40–50 years, posing significant threats to the conservation of species (Corlett, 2007; Liang et al., 2013).

Birds are usually hunted, trapped, and traded for food and nutritional value, traditional medicine, social norms, cultural aspects, pets, recreational activities, and financial benefits (Ahmed, 1997; Chang et al., 2017; Commerçon et al., 2021; Dai and Hu, 2017; Fernandes-Ferreira et al., 2012; Jenkins et al., 2017; Ramachandran et al., 2017). Annually, millions of birds are killed and traded in Africa, South America, Europe, the Middle East, Southeast Asia, and other regions (Barca et al., 2016; BirdLife International, 2010; Chang et al., 2019; Gallo-Cajiao et al., 2020; Gilbert et al., 2012; Gitau and Ngari, 2021; Kamp et al., 2015; Stafford et al., 2017; Symes et al., 2018; Yong et al., 2015), mainly due to increasing demand in the local markets (Liang et al., 2013). Consequently, the global populations of many targeted species are declining (Benítez-López et al., 2017; Kamp et al., 2015). However, little information on the hunting, trapping and trade of birds are available, except for in agricultural lands in some South Asian countries (Datta, 2021; Pandit, 1988; Ramachandran et al., 2017; Sundar and Kittur, 2013). Such information is very scarce in Nepal, except for a few opportunistic records on owls, pheasants, and other birds (Acharya and Ghimire, 2009; Dangol, 2015; Inskipp et al., 2016; Katuwal et al., 2021; Thapa and Thakuri, 2009), compared to information on mammal hunting and trade (Paudel et al., 2020a, 2020b; Sharma et al., 2020; Velho et al., 2012).

Farmland birds are commonly trapped (we used the word trapping over hunting because the majority of birds are captured with nets (e.g., mist net, fishing net) rather than with weapons) in Nepal, even though the National Park and Wildlife Conservation Act 1973 strictly stipulates that the trapping of wild birds is illegal and punishable by law. However, this is often ignored due to a lack of awareness about the importance of birds and weak law enforcement (Katuwal et al., 2021). For example, trapping wild birds (locally called *Bagedi* or *Bageri*) has received little research interest, although it is common in lowland Nepal. *Bagedi* is a Nepali word that defines the bunting (*Emberiza*) species (Grimmett et al., 2021). Buntings are small passerine birds primarily found in the farmlands



Fig. 1. Study area showing the interview locations (12 major cities/villages) in six districts of Madhesh Province, Nepal. The numbers on the map indicate Nepal's provinces; 1-Province-1, 2-Madhesh Province, 3-Bagmati Province, 4-Gandaki Province, 5-Lumbini Province, 6-Karnali Province and 7-Sudurpashchim Province.

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(mostly sugarcane fields), bushes, and grassland from the lowlands to the highlands of Nepal (Grimmett et al., 2021; Inskipp et al., 2016). The six species of buntings usually found in lowland Nepal are migratory, mostly winter visitors (Grimmett et al., 2021; Inskipp et al., 2016). So, eating *Bagedi* occurs in winter in different parts of lowland Nepal, particularly the Madhesh Province, where sugarcane fields are abundant.

Even though *Bagedi* sales have been noticed in Kathmandu, the capital city (HBK personal observations), the hotelier told us they are mainly imported from Madhesh Province. In Madhesh Province, bird trapping is more widespread, and *Bagedi* delicacies are regularly featured on hotel menus (Katuwal et al., 2021; HBK personal observations). However, it is unclear whether people are eating true *Bagedi* or other species because bunting populations are declining nationally and globally (Inskipp et al., 2016; Kamp et al., 2015) and may have reduced the chance of capturing them. We conducted this study to identify the bird species trapped in the name of *Bagedi* in Madhesh Province, Nepal. Identifying the socio-economic status and knowledge and attitudes of the people involved in trapping or trade helps to unravel the chain of trapping and trade, which can help to implement conservation programs (Raftogianni et al., 2022; Sharma et al., 2020; Souza et al., 2022). Thus, we further aimed to understand 1) socio-economic characteristics of the people involved in trapping, trading, selling, and eating *Bagedi*; 2) knowledge about the names of the *Bagedi*, their habitats, and the trends of catching/trading/selling/eating of *Bagedi* during the last ten years; 3) impact of trapping on *Bagedi* bird populations; 4) knowledge of the legal provision against the trapping of and trade in birds; and 5) willingness to stop the *Bagedi* trapping/trading/eating practices.

2. Materials and methods

2.1. Study area

This study was carried out in the Madhesh Province of Nepal (Fig. 1). Madhesh shares boundaries with Province-1 to the east, Bagmati Province to the north and west, and India's Bihar state to the south. It is one of the most populated and smallest provinces in Nepal; more than 5404,145 people inhabit an area of 9661 km² (CBS, 2012). The Madhesi dominates the ethnic communities with scattered Khas-Arya, Hill, and Terai Janjati (Katuwal et al., 2021). Nearly 45% of the population speaks Maithili, followed by Bhojpuri (19%) and various other languages by a small number of people. Also, around 85% of them follow Hinduism, whereas a few follow Islam and Buddhism (CBS, 2012). The literacy rate is below 50%, and the provincial population has a low Human Development Index (0.48; CBS, 2012). Farming is the main occupation; paddy (*Oryza sativa*), sugarcane (*Saccharum officinarum*), and maize (*Zea mays*) are grown year-round, and other crops are grown in a smaller proportion.

2.2. Research design

With the help of key informants and local people, we surveyed 12 major cities/villages (Janakpur, Mahendranagar, Dhalkebar, Lalgad, Bardibas, Barahathwa, Malangwa, Chandranigapur, Kalaiya, Pheta, Parsauni, Birganj) in six districts (Bara, Parsa, Rautahat, Sarlahi, Mahottari, and Dhanusa) of the Province from November 2018 to March 2019 to identify the trapping practices and local trade on *Bagedi* (Fig. 1). We surveyed people using semi-structured questionnaires in the local dialect, including the Nepali and Maithili languages, with the help of local assistants. Local assistants were trained before the survey. We used snowball sampling to identify the bird trappers (we used the word trapper instead of hunter when referring to trapping), middlemen, hoteliers, and customers for their knowledge, attitude, and perceptions about bird trapping and trade. Before the interview, we informed the interviewees about the data confidentiality and told them not to reveal their socio-economic identity if they were uncomfortable. However, it should be noted that all the interviewees were independent; for example, the trappers we interviewed were not the same person who supplied birds to the middlemen or hotels, and so on. We also followed two *Bagedi* trapper groups to learn about the trapping techniques; however, they did not allow us to stay during the trapping time. Also, we asked several trappers, middlemen, and hoteliers to show or provide the live *Bagedi* to identify the species. However, none agreed, except for one middleman who once brought us some live species.

We designed separate questionnaires for trappers, middlemen, hoteliers, and customers (Supplementary file 1). However, some questions were common, primarily pertaining to socio-economic status, knowing the name of the species and habitats of *Bagedi*, knowledge of the illegality of trapping, motivation for the business, and willingness to stop the business (Supplementary file 1). For trappers, we focused on the following: when they first began trapping, the locations or habitats where they trap, the months they began and ended trapping, the frequency of trapping, trapping techniques, catching frequency, the business trend (increasing/decreasing/ stable) over the past ten years, the reason for trapping, where they sold, and how they spent the money. For middlemen, we enquired about how they contacted trappers and hoteliers, *Bagedi* collecting frequency, selling price before and now, where they sold, the trend in the *Bagedi* business over the past ten years, and the profit earned. Similarly, for hoteliers, we asked when they began selling *Bagedi*, the quantity of *Bagedi* sold per day, the contribution of *Bagedi* to their business profit, and the trend of *Bagedi* business over the past ten years. For customers, we mainly asked when they began to eat *Bagedi*, how frequently they ate, and the reason behind eating *Bagedi*.

2.3. Data analysis

We calculated the descriptive statistics of the interviewee's socio-demographic structures. During the survey, we could not identify all the bird species, as we only obtained the skin-peeled species from the hotels. Based on the questionnaires and following trappers about the trapping places of *Bagedi*, we came to know that they trap *Bagedi* in farmlands, especially in sugarcane fields. So to identify the possible bird species that could have been trapped in the name of *Bagedi*, we used our earlier work, the Farmland Bird Survey Program, conducted in four districts of lowland Nepal to determine the possible bird species (Katuwal et al., 2022). The Farmland Bird Survey Program was conducted along 100 transects in agricultural lands in Sunsari, Sarlahi, Chitwan, and Kapilvastu districts (Katuwal et al., 2022). Each transect was visited around nine times in different seasons from 2018 to 2019, and four times from 2021 and 2022 to document all the possible bird species inhabiting agricultural lands. We extracted all the possible bird species from the sugarcane or the agricultural lands with sizes that would possibly allow them to be trapped and sold in the name of *Bagedi*. We also identified other species that we saw being trapped and sold by trappers and middlemen in the study area.

We summarized the trappers' trapping techniques and described how the killed *Bagedi* reached the hotels and customers. We also calculated the average number of *Bagedi* sold by each hotel per day in the primary *Bagedi* trapping season, i.e., December to February (although it occurs from November to March), and estimated the total business and number of birds killed. We analyzed the trapping or trade frequency of *Bagedi* over the past decade, as these dates can be correlated with greater precision than older dates. We also analyzed the people's knowledge of current laws and regulations against bird trapping, trading, selling, and consumption in Nepal and their attitudes towards *Bagedi* conservation, i.e., willingness to stop *Bagedi* trapping, trading, or selling and consuming.

3. Results

We interviewed 220 people (24 trappers, 26 middlemen, 65 hoteliers, and 105 customers), 94% of whom were males. Most trappers (72%) were 30–50 years old, but more customers (81%) were aged 20–40 years old (Table 1). Most of the trappers (76%) were illiterate, but around 70% of the customers had higher education (secondary to master level; Table 1). Agriculture and different local-scale businesses were the primary occupations of trappers and the middlemen, whereas the customers had a variety of professions, including teaching, farming, and business, among others (Table 1).

3.1. Identifying the Bagedi species

Not all the interviewed trappers knew the names of the *Bagedi* birds. However, they all knew *Bagedi* were found in sugarcane fields, agricultural lands, open areas, or bushlands. We visited the bird trapping places in sugarcane fields early in the morning twice and found slaughtered heads and legs of 100–150 birds, mainly from Baya Weavers (*Ploceus philippinus*), Scaly-breasted Munias (*Lonchura punctulata*), and a few Common Mynas (*Acridotheres tristis*) and Red-vented Bulbuls (*Pycnonotus cafer*; Fig. 2). The trappers also told us that they call all the trapped species in their nets as *Bagedi* (Fig. 2). In addition, one middleman brought 12 Black-headed Buntings (*Emberiza melanocephala*; Fig. 2), and we noticed Common Rosefinches (*Carpodacus erythrinus*) and Crested Buntings (*Emberiza lathami*) on other days in the farmland. Therefore, based on trappers, middlemen, and our visits to sugarcane fields and other lowland farmlands, we identified 25 similar-sized farmland bird species that were most likely trapped, killed, and sold under the name of *Bagedi* (Table 2). Of these species, the Yellow-breasted Bunting, (*Emberiza aureola*) is globally and nationally Critically Endangered, the Black-faced Bunting (*Emberiza spodocephala*), Black-headed Bunting, and Little Bunting (*Emberiza pusilla*) are nationally Vulnerable, and the Baya Weaver and Indian Silverbill (*Euodice malabarica*) are nationally categorized as Near Threatened (Table 2). Besides this, we also observed the trapping and selling of five other resident bird species, such as Cattle Egret (*Bubulcus ibis*), Common Myna (*Acridotheres*)

Table 1

Socio-economic characters of bird trappers, middlemen, hoteliers, and customers interviewed in Madhesh Province, Nepal. As we did not require interviewees to state their socio-economic status, the total number in each category may or may not equal the total number of interviews conducted.

Socio-economic characteristic	Trapper	Middleman	Hotelier	Customer
Total interviewees	24	26	65	105
Sex				
Male	96% (n = 23)	100% (n = 26)	83% (n = 50)	99% (n = 93)
Female	4% (n = 1)	-	17% (n = 10)	1% (n = 1)
Age				
20–29	18% (n = 4)	38% (n = 6)	21% (n = 12)	47% (n = 43)
30–39	41% (n = 9)	18% (n = 3)	35% (n = 20)	35% (n = 32)
40–49	32% (n = 7)	38% (n = 6)	41% (n = 24)	13% (n = 12)
50–59	9% (n = 2)	6% (n = 1)	3% (n = 2)	4% (n = 4)
> 60	-	-	-	1% (n = 1)
Education				
Illiterate	76% (n = 13)	-	12% (n = 7)	8% (n = 7)
Primary or below (grade ≤ 8)	24% (n = 4)	69% (n = 11)	37% (n = 22)	23% (n = 20)
Secondary (grade 9 and 10)	-	31% (n = 5)	25% (n = 15)	16% (n = 14)
Higher secondary (grade 11 and 12)	-	-	24% (n = 14)	23% (n = 20)
Above Bachelor	-	-	2% (n = 1)	30% (n = 27)
Major occupation				
Labor	29% (n = 6)	-	-	3% (n = 3)
Agriculture	48% (n = 10)	14% (n = 2)	3% (n = 2)	10% (n = 9)
Local business	9% (n = 2)	72% (n = 10)	3% (n = 2)	30% (n = 26)
Hotel	-	-	92% (n = 55)	2% (n = 2)
Job (private and government)	-	-	-	7% (n = 6)
Student	-	-	-	10% (n = 8)
Teacher	-	-	-	13% (n = 11)
Others	14% (n = 3)	14% (n = 2)	2% (n = 1)	25% (n = 22)



Fig. 2. Trapping equipments and photographs of *Bagedi*; A. a net used for trapping, B. nomadic trappers entering a sugarcane field with long, pointed bamboo poles, a net to trap *Bagedi* at dusk, and a bamboo basket to carry the trapped birds, C. Black-headed Buntings brought by a middleman, D. slaughtered heads and legs of mostly of Baya Weaver and Scaly-breasted Munia left by the above trappers in the field (observed the following day), E. a vessel full of skin-peeled *Bagedi* at a hotel, F. a menu at a local hotel advertizing *Bagedi* and its price (in Nepali), G. a hotelier showing a single piece of *Bagedi*, H (© Rajendra Gurung) and I. fried *Bagedi*.

tristis), Lesser Whistling-duck (Dendrocygna javanica), Plum-headed Parakeet (Psittacula cyanocephala), and Rose-ringed Parakeet (Psittacula krameri).

3.2. Habitats and techniques used by the trappers

The trappers said they trapped *Bagedi* primarily in sugarcane fields (54%) and open agriculture fields (41%), with very few in forest and riverine areas. Most trappers (83%) used nets for trapping, with others using catapults. Based on our observation while following the trapper groups and interactions with other trappers, we found that they first observed the movement of bird flocks entering the sugarcane fields, either by sitting on a tree top or from an open place. Having confirmed that a particular sugarcane plot has more bird flocks than others, they put the long nets mainly in the late evening, night, or early morning on one or two sides of the field. Then they chase the birds towards the nets. Birds usually do not fly away because it is dark; they move away from the trappers and eventually are trapped in the nets. Most trappers (80%) trap *Bagedi* from October/November to March/April (December to February is the peak time), but the remaining trappers trap throughout the year.

About 50% of the interviewed trappers were professional trappers (trapping more than ten times a month), and traveled to different places for trapping. The others were occasional trappers (<10 times a month) as they usually trapped in their localities. The number of trapped birds varied between the occasional and professional trappers. On average, the occasional trapper trapped 40–60 birds on a hunt day, whereas the professional trappers trapped 100–130 birds. Professional trappers claimed that agriculture alone was insufficient to support their families; therefore, they engaged in bird trapping mainly during the winter season.

Table 2

Farmland birds that are likely to be trapped and sold under the name of *Bagedi* in Madhesh Province, Nepal. These include both true buntings and similar-sized farmland birds. The bird data are from our Farmland Bird Survey Program conducted in lowland Nepal from 2018 to 2019 (Katuwal et al., 2022) and 2021–2022. We provided each bird species' migration status and threatened status following Inskipp et al. (2016).

Common Name	Scientific Name	Migration	Global IUCN Status	National IUCN Status
Ashy Prinia	Prinia socialis	Resident	LC	LC
Ashy-crowned Sparrow-lark	Eremopterix griseus	Resident	LC	LC
Baya Weaver*	Ploceus philippinus	Resident	LC	NT
Bengal Bushlark	Mirafra assamica	Resident	LC	LC
Black-faced Bunting	Emberiza spodocephala	Winter visitor	LC	VU
Black-headed Bunting*	Emberiza melanocephala	Winter visitor	LC	VU
Bluethroat	Luscinia svecica	Winter visitor	LC	LC
Blyth's Reed Warbler	Acrocephalus dumetorum	Winter visitor	LC	LC
Common Rosefinch*	Carpodacus erythrinus	Winter visitor	LC	LC
Common Stonechat	Saxicola torquatus	Winter visitor	LC	LC
Crested Bunting*	Emberiza lathami	Resident	LC	LC
House Sparrow	Passer domesticus	Resident	LC	LC
Indian Silverbill	Euodice malabarica	Resident	LC	NT
Little Bunting	Emberiza pusilla	Winter visitor	LC	VU
Olive-backed Pipit	Anthus hodgsoni	Winter visitor	LC	LC
Oriental Skylark	Alauda gulgula	Resident	LC	LC
Paddyfield Pipit	Anthus rufulus	Resident	LC	LC
Pied Bushchat	Saxicola caprata	Resident	LC	LC
Plain Prinia	Prinia inornata	Resident	LC	LC
Red-vented Bulbul*	Pycnonotus cafer	Resident	LC	LC
Rosy Pipit	Anthus roseatus	Winter visitor	LC	LC
Scaly-breasted Munia*	Lonchura punctulata	Resident	LC	LC
Tree Pipit	Anthus trivialis	Winter visitor	LC	LC
Tricoloured Munia	Lonchura malacca	Resident	LC	LC
Yellow-breasted Bunting	Emberiza aureola	Winter visitor	CR	CR

Note: * we confirmed trapping of these species during our study.

3.3. Bagedi trade and impact on the bird population

3.3.1. Bagedi supply chain

The chain of *Bagedi* supply was complex; 22% of the trappers said they sold *Bagedi* to hotels only, 17% to public houses only, 6% to middlemen only, 17% to both hotels and public houses, 11% to both local markets and hotels, and 27% to all of these areas. Regarding middlemen, 76% reported contacting trappers to obtain *Bagedi*, whereas the trappers contacted 24%. Usually, middlemen approached different trappers to obtain *Bagedi*, and 80% also said they provided advance money to the trappers to supply *Bagedi*. Each middleman provided *Bagedi* to multiple hotels, depending upon their contacts, with 85% providing the *Bagedi* to hotels only, 11% supplying to hotels and taking the rest to their home, and the remaining middlemen sold to the local market or public houses. All hoteliers said they obtained *Bagedi* from trappers and middlemen, and usually, 10–13 customers came for *Bagedi* in each hotel every day in the season. Most customers said they came with friends at least 3–4 times a month, and 58% also said they take *Bagedi* to their homes. On average, customers (n = 96) reported that they had been eating *Bagedi* since seven years ago (range: 1–40 years). Most customers (85%) thought *Bagedi* was expensive compared to other food items at the hotel, but all liked to eat it due to its taste, the belief in producing heat in the body in winter, and having aphrodisiac properties.

3.3.2. Bagedi business

We found one hotel that had sold *Bagedi* since 1981, and it was freely listed in the hotel menu (Fig. 2). Trappers sold *Bagedi* for Nepalese Rupee (NPR) 20–35 each, and the middlemen sold them for NPR 30–40 each to the hoteliers. Each middleman (n = 14) made a profit of NPR 110,000–125,000 per season (USD 955–1085). Most (78%) of the hoteliers thought that selling *Bagedi* had attracted customers and increased their daily business. On average, it contributed about 15% of the annual income of the hoteliers. The selling price of the *Bagedi* varies with the standard of the hotels (NPR 300–800/plate; eight pieces/plate). The customer's average purchase price (n = 55 hotels) is about NPR 520/plate. These hotels sold about 160–180 plates of *Bagedi* per day, corresponding to an estimated business of NPR 7488,000 to 8424,000 (USD 65,113–73,252) within the three-month peak season in the study area. Within our study area, the Dhanusa district accounted for around 70% of the business, making it one of the hotspots for *Bagedi* consumption.

3.3.3. Trends in bird population and business

Trappers disagree about the trend of the bird populations; 45% of trappers thought the trapped birds decreased during the last ten years, 45% thought they increased, and the remaining thought they were stable. Among the middlemen, 62.5% thought that the trend of the *Bagedi* business was increasing during the last ten years, 25% thought it was stable, and a few thought it was declining. Among the hoteliers, 67% thought that *Bagedi*'s business had increased since ten years ago, 15% thought it was declining, 17% thought it was stable, and the remaining hoteliers did not know the trend. Most (90%) of the hoteliers estimated that the price of *Bagedi* they paid had increased by NPR 150–200 per dozen during the last ten years.

3.3.4. Impact of trapping on bird populations

To sell 160–180 plates of *Bagedi* per day in the study area, trappers would have to trap and supply 1280–1440 individual *Bagedi* daily. During the 90-day peak season, this would amount to 115,200 to 129,600 killed birds.

3.4. Knowledge on rules and regulations against illegal trapping

Most of the people interviewed claimed to be unaware that trapping, trading, selling, and eating *Bagedi* was illegal in Nepal; 79% of trappers, 92% of middlemen, 70% of hoteliers, and 86% of customers, and almost all interviewee also claimed that they do not know the punishment against it. The majority of trappers (74%) and middlemen (88%) reported that they had not been arrested by any authority for trapping and trading, whereas the authorities arrested other people. Also, 90% of the hoteliers said that no one had told them not to conduct the *Bagedi* business or sell *Bagedi* and 90% of customers also said that no one had told them before not to eat *Bagedi*. Only 16% of the trappers said they trapped *Bagedi* for food; for other trappers, middlemen, and hoteliers the primary motivating factor for the *Bagedi* business was the high price and the customer demand.

3.5. Willingness to stop the Bagedi business

The occasional trappers (50%) agreed to stop *Bagedi* trapping, but the professional trappers (the remaining 50%) said trapping, trading, or eating *Bagedi* should not be stopped, as did 92% of the middlemen, 56% of the hoteliers, and 54% of the customers.

4. Discussion

For the first time, our study highlighted wild bird trapping and eating practices that the authorities have overlooked since the 1980 s in Madhesh Province, Nepal. Large numbers of birds are trapped to fulfill the customers' demand, which has imposed significant threats to the farmland bird population and the conservation of birds in Nepal.

Farmland birds are declining faster than other habitat-specialist bird species (Inskipp et al., 2016; PECBMS, 2020; Stanton et al., 2018), probably partially due to their worldwide hunting, trapping, and trade (Godin et al., 2021; Heim et al., 2021; Kamp et al., 2015). The main problem of the trappers and middlemen in the study area is that they did not know the name of the species and their threatened status (Katuwal et al., 2021), which enhanced the unintentional killing of all types of birds, including globally threatened species. Trappers supply skinned birds, so it is difficult to identify the species without covert surveys or genetic analyses. Previously, we expected that people were not eating true bunting species due to their lower occurrence and population decline globally (Yellow-breasted Bunting - Critically Endangered; Kamp et al., 2015 and nationally (Yellow-breasted Bunting - Critically Endangered, Black-headed Bunting and Black-faced Bunting both - Vulnerable; Inskipp et al., 2016). However, our study showed that many small passerine birds, including buntings in smaller quantities, are still trapped, traded, or eaten in Nepal; this practice is also common in North India (Ahmed, 1997). Possibly, trappers used to trap true buntings before, but due to their declining population and lower occurrences, they might have shifted to other similar-sized birds to fulfill the market demands. The trappers may have sold skinned birds to confuse hoteliers and customers about the actual bird species. Consequently, trapping threatens many other farmland bird species and buntings; for example, Baya Weaver and Indian Silverbill are already upgraded to Near-threatened in the National Red List Status of Birds (Inskipp et al., 2016). In addition to Bagedi, other birds, such as parakeets for pets and egrets and ducks for food, are regularly trapped in our study area. Not only in Nepal, trapping of such birds along with Bagedi can be found in other South and Southeast Asian countries (Ahmed, 1997; Datta, 2021; Yong et al., 2022), imposing more significant risks to all kinds of bird species.

Bagedi trapping and eating seemed to be most common in the winter, probably due to the birds' migration in large flocks in the lowland of Nepal (Inskipp et al., 2016; Kamp et al., 2015), and consumer's willingness to consume more meat in the winter season. In our study site, using nets is the most common method of capturing birds, similar to Yong et al. (2022), although other studies also report using different techniques, such as traps, snares, poisoning, guns, and hooking (Chang et al., 2017; Dai and Hu, 2017; Datta, 2021). The professional trappers revealed that some considered trapping as a family business that had been practiced since their forefathers. Trappers were usually poor and belonged to a marginalized community;some were semi-nomadic (e.g., NAT/Chidimar; some also came from India due to the open border). They frequently traveled to different places and trapped the birds at dawn and dusk (Katuwal et al., 2021). We observed that local people did not notice or oppose them, as they did not come regularly to one area, and were kind to the poor people and most of them also did not know that bird trapping is illegal in Nepal (Katuwal et al., 2021). This type of trapping has been practiced in many parts of South Asia (Ramachandran et al., 2017), and our study showed that it has occurred in Nepal for around 40 years; however, it has been largely overlooked.

Trapping is primarily driven by high income within a short period (Jenkins et al., 2017); the birds are sold to the local markets rather than kept for personal consumption to meet household needs. Rapidly increasing local urban markets mainly boosts the demand for wild birds elsewhere (Liang et al., 2013). However, those birds are rarely exported to other countries, unlike other illegally hunted animals (e.g., pangolin, tiger, rhinoceros) traded to China and India (Paudel et al., 2020b). The purpose of hunting varies. For example, hunting and trapping is associated with cultural and recreational, rather than economic, practices in southwest China (Chang et al., 2017; Commerçon et al., 2021). However, in our study, trapping was mainly market-driven for financial gain and was mostly observed along the local hotels along highways and small cities (e.g., Dhalkebar), as also observed by Ramachandran et al. (2017) and Liang et al. (2013) in South India and Hainan of China, respectively. Because the monthly income of the people living in Madhesh Province is low (CBS, 2012), the economic status of the trappers and the middlemen are also low. To fulfill their daily needs, trappers trapped and traded many birds; consequently, they showed little willingness to stop this enterprise, as they had no other options to sustain their

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livelihood. Thus, alternative livelihoods can be fostered to discourage trapping.

People eat wild meat for different purposes, such as taste and nutritional value (Commerçon et al., 2021; van Vliet et al., 2017). However, our study showed that eating *Bagedi* was for taste and the belief that the meat made the body warm in winter and had aphrodisiac properties. As it is expensive (2–3 times) relative to other food in the hotels, customers might think of pride or appear wealthier among their friends when offering its meat. Although most customers were educated, they liked to eat *Bagedi*, as most claimed not to know that eating birds is illegal or ignored the law due to weak implementation. There are very few incidents of arresting and imprisoning people for trapping, trading or consuming wild bird meat in Nepal (Paudel et al., 2020a, 2020b). Therefore, the customers' attitudes and preferences for wild meat have increased demand for wild birds, substantially increasing local business. However, customer demand enhanced by weak law enforcement has led to the decline of many bird populations across the Mediterranean, South and Southeast Asia (Brochet et al., 2016; Heim et al., 2021; Katuwal et al., 2021; Ramachandran et al., 2017). There is a general unwillingness to stop it among those involved in the trade and consumers.

We reported a high number of bird capturing and businesses associated with it in Madhesh Province, Nepal, as in other similar studies (Brochet et al., 2016; Gitau and Ngari, 2021). Our estimate was based on the number of birds hoteliers sell per day, which may vary among hotels. However, our estimate was only from three months (selling occurs during 3–5 months and in a few places year-round), so we probably did not overestimate the number of birds killed. Additionally, there was still a high possibility of additional bird killing, as we only surveyed subsets of available hotels. Some birds might be brought from the Indian side due to the open border, but news in different newspapers mentioned that confiscated birds were mostly for cage birds (The Himalayan Times, 2017; Myrepublica, 2016), yet some quantity cannot be ignored. So, the bird trapping scenario may be worse than we estimated, involving a very complex network.

Our study is primarily based on interviews with trappers, middlemen, hoteliers, and customers; therefore, it is necessary to discuss the potential limitations of the study, which may influence the species identification and number of birds captured, as well as the business. Although we followed a few trappers and middlemen to identify the trapped species, we could not confirm all targeted species because trappers provided skinned birds to the hoteliers. We used our Farmland Bird Survey Data collected in lowland Nepal (Katuwal et al., 2022) to identify species of similar-sized that are hunted under the name *Bagedi*, as trappers refer to all captured birds as *Bagedi*. Although we were able to confirm a few species, such as the Scaly-breasted Munia, Baya Weaver, Black-headed Bunting, Common Rosefinch, Crested Bunting, and Red-vented Bulbul, among others, additional fieldwork, covert survey, and genetic analysis are required to confirm the identification and trapped frequency of all possible bird species. In addition, our estimations of the wild bird population in Madhesh Province are based on a few hotels. If we had surveyed the entire Madhesh and other areas of Nepal, we believe the bird trapping scenarios would have been worse than estimated. Therefore, the findings of this study can be considered as a baseline data because it describes previously unreported *Bagedi* trapping and eating practices in Nepal.

5. Conclusions

This study has showcased an overlooked scenario of the *Bagedi* eating practice during the last 40 years in Madhesh Province, Nepal. During three months of the peak *Bagedi* eating season, trappers, middlemen, and hoteliers earn a significant income through the business, so they want to continue the business. Many birds are killed to fulfill this demand, imposing a high risk to the farmland birds. Most people claimed to be unaware of the illegality of bird trapping and its punishment, although it is probable that more were aware of its illegality than would admit it. To discourage trapping and trade of birds, we suggests that 1) the government and conservation agencies should provide alternate means of income to the people who rely significantly on the *Bagedi* business, particularly the trappers and the middlemen; 2) bird identification and awareness initiatives on the status, ecology and ecosystem provided by birds to local trappers, as well as to school children, the community, and consumers through newspaper/magazine programs. Additionally, *Bagedi* can also be promoted and linked with cultural (e.g., initiating the friends of *Bagedi*), conservation (e.g., ecological significance), and commercial values (e.g., ecotourism) in order to boost popularity among the general public to discourage trapping and eating, similar to the initiatives taken for the most trapped Amur Falcon (*Falco amurensis*) in Northeast India (see Aiyadurai and Banerjee, 2020); 3) provide information regarding the penalties for trapping, trading, and consuming wild birds in Nepal; 4) initiate programs to change the attitudes and behaviors of consumers, such as shifting to farmed species (e.g., quail species); 5) detail survey on Madhesh and other provinces of Nepal to estimate the national scale of *Bagedi* trapping and its impact on bird populations.

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Statement of Ethics and Consent to Participate

This study was conducted according to the ethical guidelines of Xishuangbanna Tropical Botanical Garden, China and the Department of Forests and Soil Conservation and the Department of National Parks and Wildlife Conservation, Nepal. Prior to the interview, verbal consents of the respondents were taken and maintained their anonymity throughout the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.gecco.2023.e02391.

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