

## Passage migration through Kachchh district in Gujarat: Insights from two years of systematic monitoring (2022-2023)

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### Abstract

Every year, India plays temporarily hosts to a special group of birds called passage migrants. Such birds neither visit during the summer nor the winter but pass through India during autumn and spring while migrating from their breeding grounds in Central and East Asia to their wintering grounds in Africa. Gujarat and Rajasthan are hubs of passage migration, with potentially hundreds of thousands of birds passing through from August to October to capitalize on available food in a landscape that's lush and full of insects after the rains. The Passage Migrant Count is a systematic citizen science initiative started in September 2022 in the Kachchh district of Gujarat to understand the region's magnitude and ecological correlation of passage migration. Over 100 birdwatchers participated during each of the two years. Results revealed the extrapolated presence of over three lakh passage migrants in the region on September 10-11, 2022, and over five lakh birds on September 24-25, 2023. Most species were present in greater numbers in 2023.

With more than three lakh estimated individuals, European Roller (*Coracias garrulus*) was the most abundant passage migrant in 2023, followed by Spotted Flycatcher (*Muscicapa striata*) with over one lakh individuals. Several other interesting insights have emerged from the counts, including the understanding that the different species have different habitat preferences when present in the region.

### Introduction

India is not just a critical winter destination for migratory birds but may also be an important 'stopover region' for birds that need to refuel during long migratory journeys (Chernetsov et al., 2007; Kumar & Alam, 2023). Birds that briefly stopover in the country during migration are called passage migrants. Passage migration in India is most pronounced during the period from August to October in northwestern India when birds from Central and East Asia pass through on their way to Africa (Chernetsov et al., 2007). Passage migration is particularly numerous in the Rajasthan desert and Kachchh in Gujarat because the region's strategic location on the migratory route between Eurasia and Africa makes it an ideal stopover for birds seeking temporary refuge and sustenance during their long journeys.



Photo: Sumanda Vinayachandran



Photo: Ramesh Shenai

Gujarat, in particular, presents a unique opportunity to observe intricate patterns of avian migration due to its diverse landscape. Over eight species of passage migrants are documented to regularly stopover in this region, including European Roller *Coracias garrulus*), Red-backed Shrike *Lanius collurio*), Red-tailed Shrike *Lanius phoenicuroides*), Spotted Flycatcher *Muscicapa striata*), Rufous-tailed Scrub-Robin *Cercotrichas galactotes*), Greater Whitethroat *Curruca communis*), Common Cuckoo *Cuculus canorus*) and Blue-cheeked Bee-eater *Merops persicus*) (Praveen et al., 2023).

Despite a long history of bird monitoring in India (e.g., Asian Waterbird Census), passage migrants have largely been overlooked. We do not have a sense of the numbers or the abundance trends of passage migrant populations that move through India. Such knowledge can inform conservation action in India and play an important role in supporting global population assessments of these species. To address this gap in knowledge and lay the foundation for systematic monitoring of passage migrants in India, Bird Conservation Society Gujarat (BCSG) and Bird Count India (BCI) partnered to start the Passage Migrant Count in Kachchh, Gujarat, in 2022.

Passage Migrant Count (PMC) was designed to be an annual or bi-annual survey conducted by volunteer birdwatchers using a systematic scientific protocol. This article outlines what was learned during the first two years of the PMC.

## Methods

PMC is a volunteer-driven citizen science initiative (Bird Count India 2023). A call for volunteers was put out a few months in advance in both years so there would be enough participants to survey the entire landscape for passage migrants. Participants were divided into teams of 2-4 birdwatchers, and a team always included at least one experienced birdwatcher and others who could use the opportunity to learn and gain experience. The survey design differed slightly during the two years.

In 2022, 250+ survey points were randomly identified across the landscape so that the entire Kachchh landscape (except the inaccessible white Rann) was uniformly represented. Points were then assigned to teams so that each team could base themselves at a convenient location to reach these points. A team was then expected to make a single 'travelling' eBird checklist at each point assigned to them by walking 500m on each side. 104 birdwatchers in 26 teams surveyed the landscape on Sep 10-11, 2022, and created a total of 254 'complete' eBird checklists (Fig. 1).

In 2023, the protocol was improved, so teams were assigned grids rather than survey points. A team was expected to make a single 1 km long travelling checklist inside every assigned grid, ensuring they remained inside the grid throughout. During 2022, many points were not accessible, prompting this

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change. 100 birdwatchers in 34 teams surveyed the landscape on Sep 24-25, 2023, and created a total of 224 'complete' eBird checklists (Fig. 1).

For analyses, we considered each taluka as a geographically meaningful region but combined a few regions (Fig. 2). The large Greater Rann of Kachchh and Little Rann of Kachchh region were not considered because they were outside the reasonable logistic scope of the count. Red-tailed Shrike was excluded from all analyses due to identification difficulties.

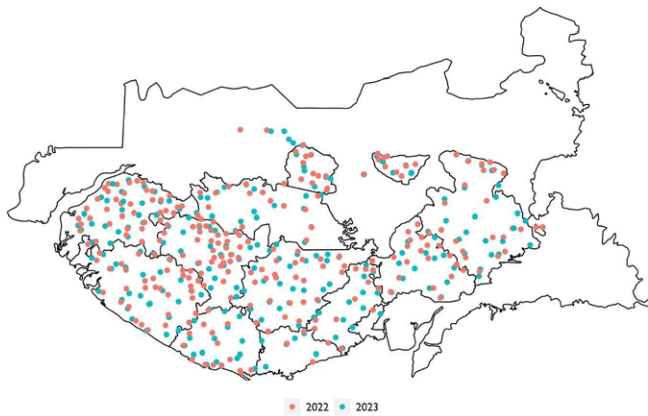


Fig. 1: Sampling locations across the Kachchh district in both years.

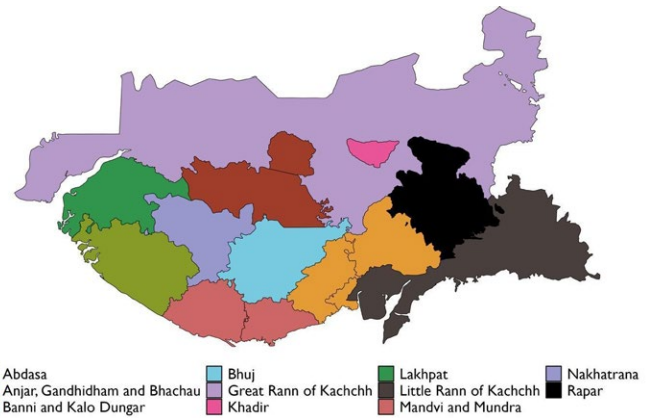


Fig. 2: Combined regions in Kachchh.

For each species, we calculated the mean count and frequency of reporting (number of lists with a species/total unique lists) in each region. Counts were standardized across the years to 1 km of distance travelled using a conversion factor that scaled according to the mean distance travelled in the checklists uploaded during that year (a consequence of the changed protocol). Assuming that counts were made up to 500m on each side of a transect, we estimated the mean count of each species per sq. km. in each region. We also used



Photo: Ramesh Shenai

similar logic to estimate the total number of passage migrants present in each region (by extrapolating to the total area of each region), the total extrapolated number of each passage migrant species, and the total number of passage migrants present in Kachchh during the count. Blue-cheeked Bee-eater *Merops persicus* was excluded from region-wide and across-species extrapolations due to their nature of occurring in sparse but large aggregation

### Results

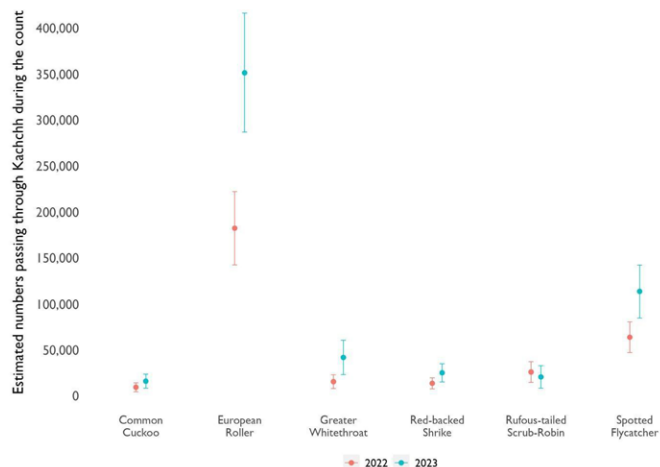


Fig. 3: Extrapolated abundance of each passage migrant species in 2022 and 2023.

We estimated that a total of  $568,612 \pm 75,278$  (95% CI) passage migrants [excluding Blue-cheeked Bee-eater *Merops persicus*] were present in Kachchh on September 24-25, 2023 (Table 1, Fig. 3). On September 10-11, 2022, the estimated number was lower at  $312,362 \pm 46,207$ . The European Roller *Coracias garrulus* and Spotted Flycatcher *Muscicapa striata* were the most abundant species, with over 300,000 and

100,000 birds estimated to be in passage, respectively. Both were considerably more numerous in 2023. Rufous-tailed Scrub-Robin *Cercotrichas galactotes* and Greater Whitethroat *Curruca communis* were the next most numerous, with over 15,000 birds estimated to be in passage in the landscape.

We found that passage migrants were more heterogeneous in their landscape use in 2022 compared to 2023 (Fig. 4).

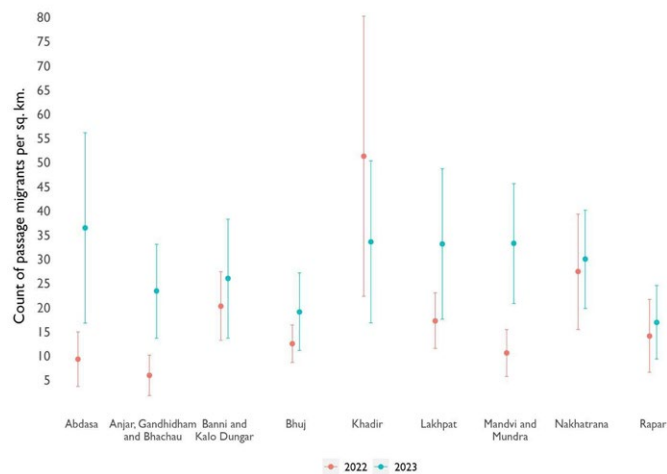


Fig. 4: Extrapolated abundance of passage migrant species in each region in 2022 and 2023.

Despite the relative homogeneity of passage migrant presence across the regions in 2023, different species seemed to have different favoured regions (although the differences balanced out). European Roller *Coracias garrulus* was fairly widespread in the landscape but most numerous in Abdasa and Nakhatrana in 2023 (Fig. 5). On the other hand, Spotted Flycatcher *Muscicapa striata* was most abundant in the southern regions (Fig. 6).

**Table 1: Estimated numbers (with associated 95% confidence intervals) of each species and, in total, to pass through Kachchh district on the survey days in 2022 and 2023.**

Species	Count 2022	Count 2023
European Roller	182,470 ± 40,067	351,620 ± 64,674
Spotted Flycatcher	63,932 ± 16,751	113,465 ± 28,703
Rufous-tailed Scrub-Robin	25,992 ± 11,295	41,886 ± 18,734
Greater Whitethroat	15,446 ± 7,510	25,096 ± 9,943
Red-backed Shrike	13,603 ± 5,995	20,587 ± 12,285
Common Cuckoo	9,310 ± 4,913	15,959 ± 7,717
All passage migrants	312,362 ± 46,207	568,612 ± 75,278

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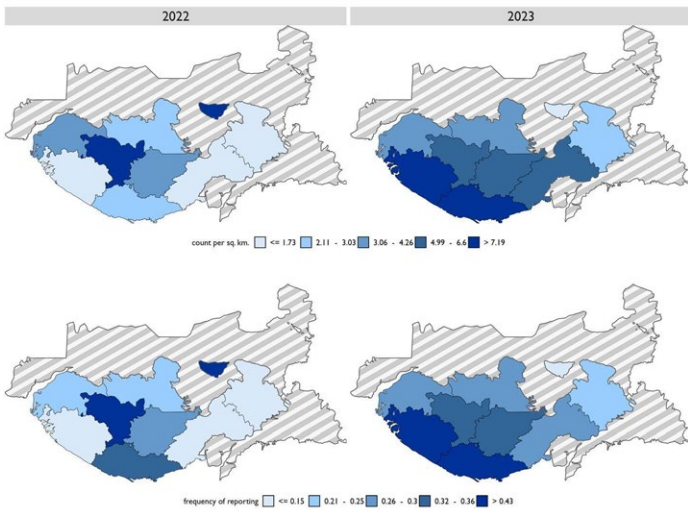


Fig. 5: European Roller *Coracias garrulus* presence in the different regions in Kachchh.

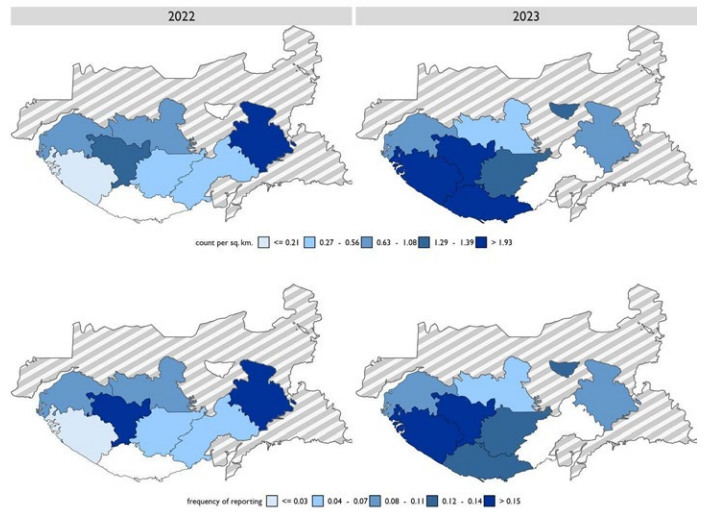


Fig. 7: Greater Whitethroat *Curruca communis* presence in the different regions in Kachchh.

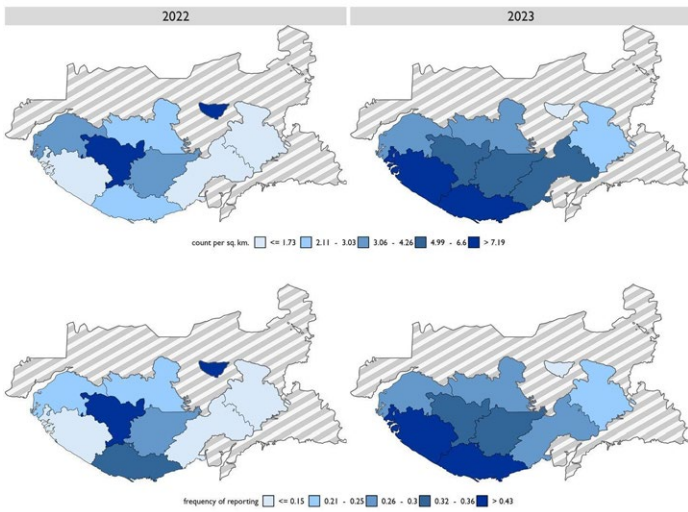


Fig. 6: Spotted Flycatcher *Muscicapa striata* presence in the different regions in Kachchh.

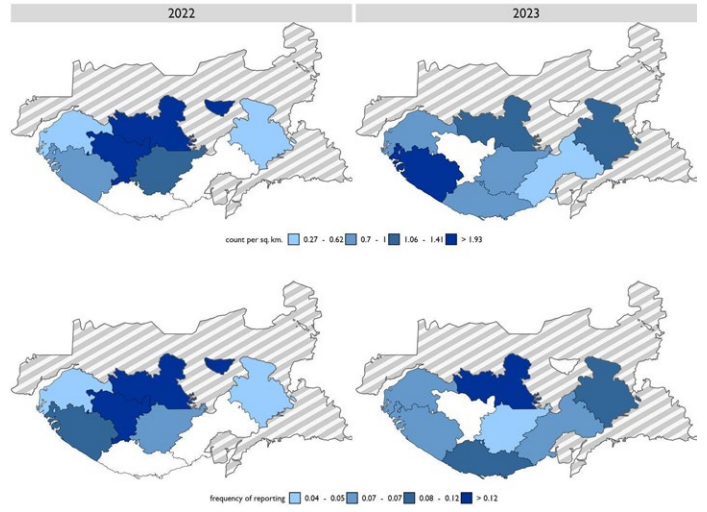


Fig. 8: Rufous-tailed Scrub-Robin *Cercotrichas galactotes* presence in the different regions in Kachchh.

Greater Whitethroat *Curruca communis* and Rufous-tailed Scrub-Robin *Cercotrichas galactotes* were present in entirely different regions during both the years (Fig. 7-8). Greater Whitethroat *Curruca communis* was most numerous in the eastern parts of the region in 2022 but was most numerous in the southwestern parts in 2023. Similarly, Rufous-tailed Scrub-Robin *Cercotrichas galactotes* was most abundant in the thorn forest regions of Nakhatrana, Banni, and Khadir in 2022 and was absent in the southern parts, whereas not a single bird was detected in Nakhatrana in 2023 and there were birds present in the south.

During both years, the Blue-cheeked Bee-eater *Merops persicus* was only present in the open landscapes of the eastern regions in Kachchh (Fig. 9).

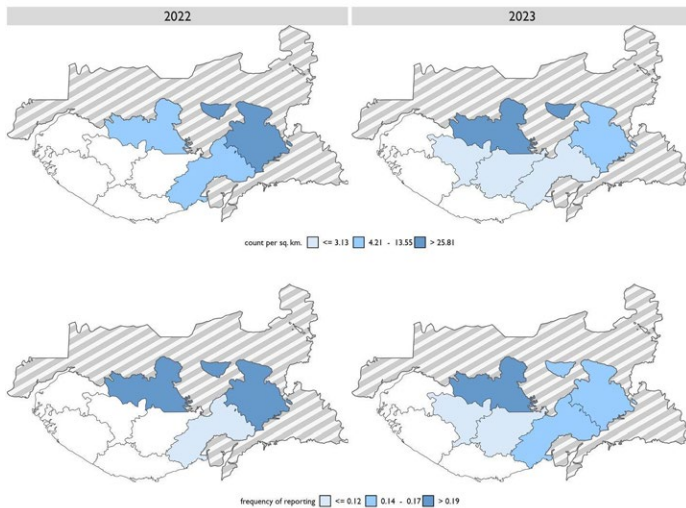


Fig. 9: Blue-cheeked Bee-eater *Merops persicus* presence in the different regions in Kachchh.

In addition to the passage migrants themselves, a few more passage migrants through the region were detected, including Brown Shrike *Lanius cristatus*, European Nightjar *Caprimulgus europaeus*, Indian Spotted Eagle *Clanga hastata*, Common Grasshopper Warbler *Locustella naevia* and Blyth's Pipit *Anthus godlewskii*.

### Conclusion

The systematic nature of Passage Migrant Count has enabled the first numeric assessments of passage migrants moving through the Kachchh district of Gujarat, providing a vital baseline. We found many differences between habitat use in 2022 and 2023, but this might be because the dates were two weeks apart or because of certain weather conditions associated with either or both surveys. Some species, like Blue-cheeked Bee-eater *Merops persicus*, favoured open landscapes adjacent to the Rann; others, like Rufous-tailed Scrub-Robin *Cercotrichas galactotes*, favoured thorn forests. To truly understand these patterns, surveys may be required multiple times a season and over a long term. Programmes such as these play an important role in involving the public in scientific monitoring while also showcasing the beauty of the landscape and must continue to be a participatory survey in the years to come (Bonney et al., 2009, 2014; Dickinson et al., 2010).

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