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Research Article

Blue-and-White Flycatcher (*Cyanoptila cyanomelana*): A New Avifaunal Chapter in Pakistan's Biodiversity Based on Morphological and Acoustic Evidence from Mehrano Wildlife Sanctuary

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Abstract

Pakistan is recognized for its diverse avifauna, particularly as a wintering ground for numerous migratory species that arrive via the Central Asian Flyway (CAF) and neighboring regions. In 2025, Pakistan documented a significant record of the Blue-and-White Flycatcher (*Cyanoptila cyanomelana)*, a migratory songbird belonging to the family Muscicapidae, observed on January 11 at the Mehrano Wildlife Sanctuary in Sindh (GPS coordinates: 27°18'16"N 68°41'09"E). Four individuals were photographed to provide evidence-based documentation, and their characteristics were meticulously analyzed using sonograms and taxonomical attributes. The Blue-and-White flycatcher is a winter visitor to Southeast Asia including India, where sightings are infrequent. This observation represents the first documented occurrence of the species in Pakistan, supported by direct field observations and photographic evidence. This remarkable discovery constitutes a significant enhancement to the region's avifaunal diversity and underscore the conservation initiatives undertaken by the Sindh Wildlife Department. This rare and elusive record of the Blue-and-White Flycatcher offers valuable insights into the migration patterns of avian species in South Asia, highlighting the necessity for monitoring and conserving critical habitats within protected areas.

Keywords: Blue-and-White Flycatcher, *Cyanoptila cyanomelana*, first national record, Mehrano Wildlife Sanctuary, Muscicapidae.

1. Introduction

The Blue-and-white Flycatcher (*Cyanoptila cyanomelana*) is a migratory songbird belonging to the family Muscicapidae, predominantly found in northeastern Asia [1-5]. It exhibits notable seasonal movements, breeding primarily across Japan, Korea, northeastern China, and regions of Russia. During winter months, populations migrate southward to warmer climates in Southeast Asia, including Taiwan, southeastern China, Vietnam, Thailand, Malaysia, Indonesia, the Greater Sunda Islands, and the Philippines [2, 6]. This species has two widely recognized subspecies: the nominate *cyanomelana*, breeding in the southern Kuril Islands, Japan, and South Korea, and *cumatilis*, found in northeastern China, southeastern Russia, and North Korea [6]. Notably, sightings outside their usual migratory pathways, such as the record from Sri Lanka in 2014, indicate occasional deviations in migration and potential expansions of their known range. Its presence in South Asia is a recent addition to avifaunal records, as earlier comprehensive bird guides (Handbook of the Birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka; Birds of South Asia: The Ripley Guide: Attributes and Status; and Birds of the Indian Subcontinent) [7-9] have not included this species [5].

Morphologically, the male Blue-and-white Flycatcher is characterized by its striking blue upperparts, which contrast sharply with a white belly, and along extensive black marking

on the frontal regions, lores, and cheeks (see detailed in Table 2). In contrast, females exhibit a more subdued olive-brown coloration [10]. Initially, diagnostic characters indicated that the white coloration at the base of the tail was indicative of the subspecies *cumatilis*. However, recent research challenges this assumption due to inconsistencies across museum specimens, emphasizing the complexity of subspecies identification through morphology alone [11]. The presence of juvenile greater coverts and tertials has proven useful in identifying juvenile males, however, it remains inadequate for definitive racial identification based solely on photographs [2]. In contrast to the morphological attributes, songs and calls serve as essential tools for recognition among many bird species. Each species has developed a range of vocalization, including both longer, complex songs and shorter alarm calls [12]. Bird produces short syllables and utter long lasting complex calls [13]. Understanding that avian interaction rely heavily on sound communication is crucial. The intended recipients must be able to hear these vocalizations clearly to accurately interpret the signals and engage in effective communication [14]. The two primary components of avian songs—a trill and flourish— from the basis for categorizing various song type. According to Slater [15], certain bird species may exhibit as many as six distinct song genres [12].

When morphological characteristics are unclear or overlap, species identification becomes more intricate. Vocal characteristics including pitch, syllable repetition rate, and strophe structure provide species-specific auditory signatures that are independent of age or seasonal plumage. To confirm the new Blue-and-white Flycatcher record, we also compared the sonograms of four closely similar species in our study (Figure 4, 5). The presence of *Cyanoptila cyanomelana* in Sindh, far west of its expected migratory route, raises questions about possible shifts in flyways due to environmental changes. Factors such as climate change, altered habitat conditions, or food availability may be influencing migration patterns, pushing vagrant individuals into previously undocumented regions. But since there has not been any documentation of *Cyanoptila cyanomelana* presence in Sindh up to this point, the scientific community has identified the area as one of interest for upcoming avian research and conservation initiatives.

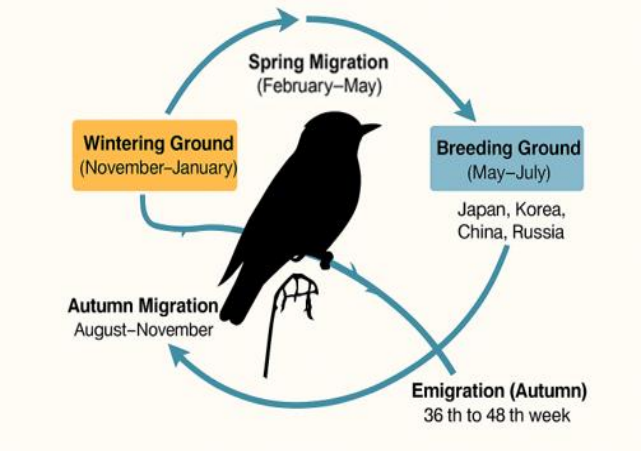

Figure 1. Illustration of Blue-and-white Flycatcher Migration and Distribution Pattern: Annual migration cycle across East and Southeast Asia elucidates the northern breeding range, which includes Japan, Korea, northeastern China, and southeastern Russia from May to July. Southward autumn migration begins in August and continues through November, when the flycatcher moves to its wintering grounds in Southeast Asia, including Taiwan, the Philippines, and the Greater Sunda Islands. From November to January, the species remains in these warmer regions. Spring migration occurs between February and May, as individuals return to their northern breeding habitats. The Indo-subcontinent may serve as a stopover during winter migration. Estimated movement windows for such regions suggest southward emigration occurs between the 36th and 48th weeks of the year.

2. Materials and Methods

2.1. Study Area and Field Survey

The survey was carried out by wildlife Photographers (Ali Raza Talpur, Mir Muhammad Hussain Talpur, Zoulfiqar Talpur, Zaheer Abbas Talpur, and Ghulam Ali Talpur) where they made an extraordinary discovery of the Blue-and-white Flycatcher, a bird species recorded for the first time in Pakistan. The study site was Mehrano wildlife sanctuary, District Khairpur Mirs which is two miles away from Kotdiji and 20 miles from main city Khairpur. From the dense canopy of indigenous plants, with *Ficus religiosa*, *Dalbergia sissoo*, and *Azadirachta indica*, the groups' attention was drawn to the distinctive sound of a bird [16-18].

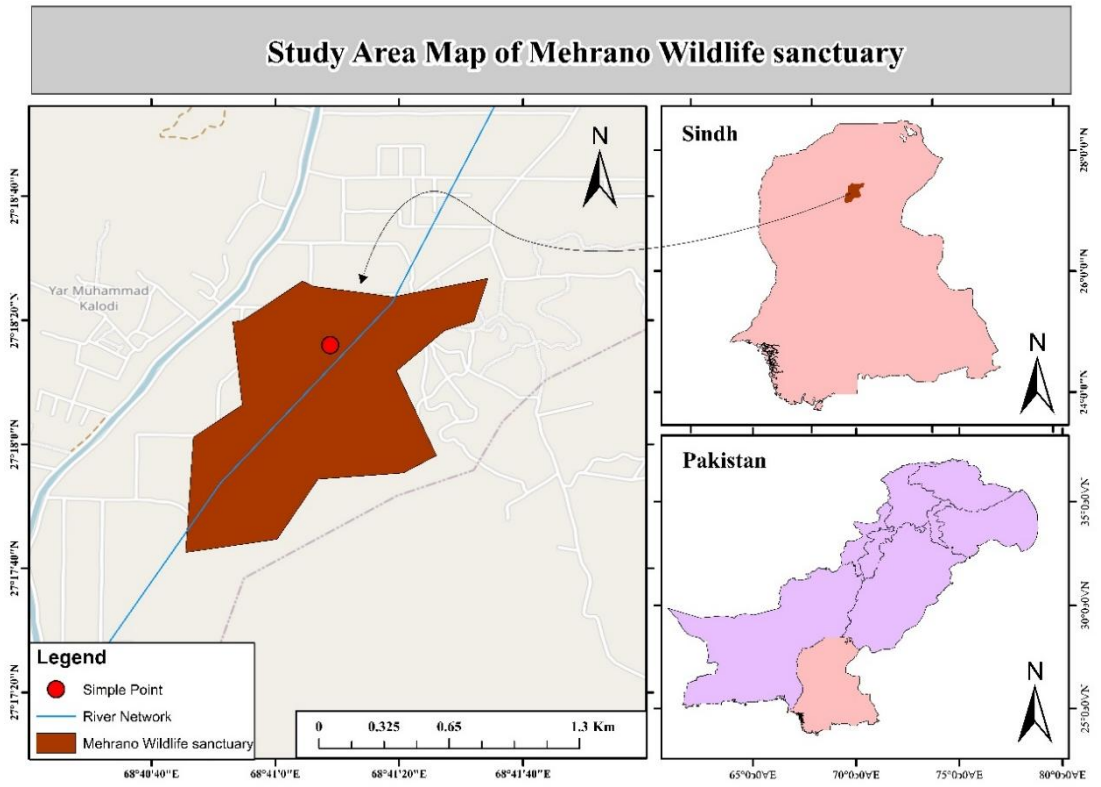

Figure 2. Illustrates the location where the Blue-and-White Flycatcher was observed during wildlife patrol excursions.

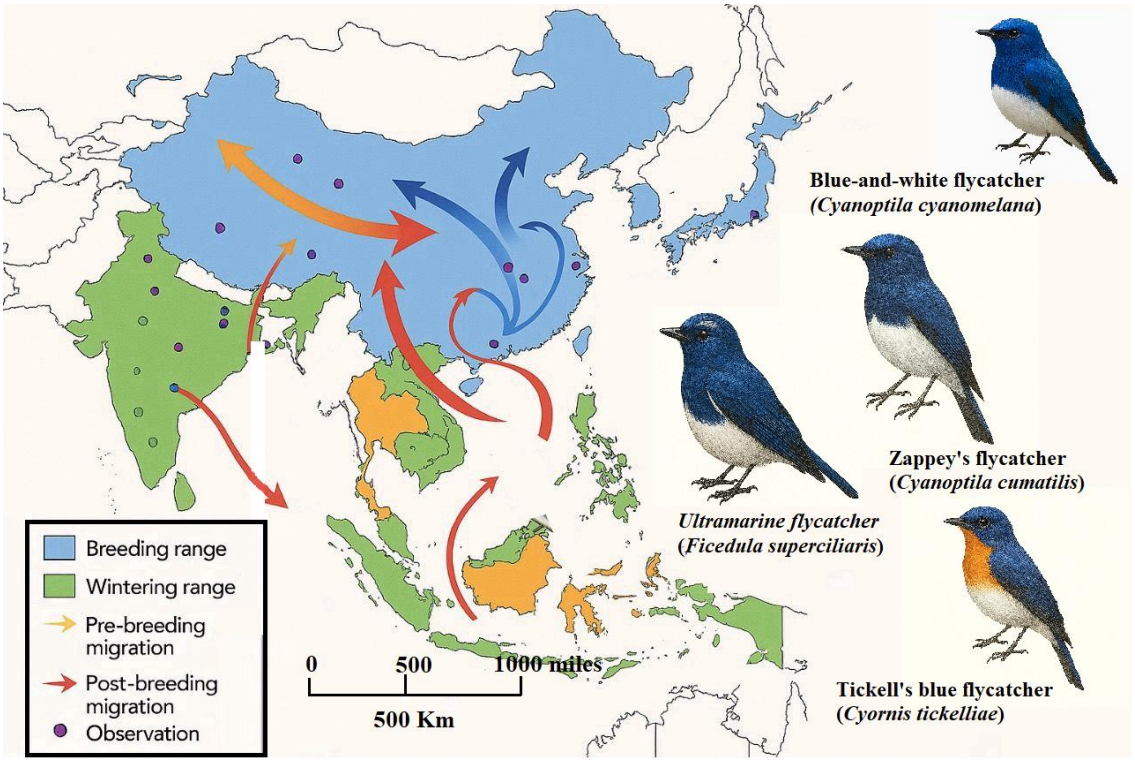

Figure 3. Map of the migration pattern of Blue and White flycatcher with three other bird species, including unexpected observational sightings of *Cyanoptila cyanomelana* from the Indo-subcontinent region

2.2. Identification and verification

The initial identification was consulted with multiple senior Ornithologists, and reviewed by several field guides i.e., Helm field Guides (Birds of the Indian Sub-continent [9], Birds of Japan and East Asia [1,4] and [7] (Handbook of the Birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka)). The GPS was taken to draw the map of the sight (GPS coordinates: 27°18'16"N 68°41'09"E) Figure 2. The detailed key field characters were made to compare the four closely related species of the family Muscicapidae, Table 2.

2.3. Literature review and Sonogram analysis:

A comprehensive review of published scientific literature was conducted and the previous records were sourced from eBird, Avibase, and Birds of the World (Figure 3, and Table 1). Raven Lite software was employed used to analyzed the spectrogram of birds' acoustic features, while a bar plot was generated using R studio with the packages ggplot2, geom_bar, geom_point, and geom_line [19].

3. Results

The study was primarily focused on the occurrence of Blue-and-white flycatcher from Mehrano Wildlife Sanctuary. It holds historical significance, associated with the Talpur dynasty, though this study focuses on its ecological relevance for avian species. In this paper, authors have reviewed all the available resources including Birdlife International [20, 21], ebird [22], Birds of the World [23], South Asian avifaunal database, and social media platforms to confirm the status of the new record from this or near region. Many birdwatchers initially doubted on species as ultramarine flycatcher later on identified and confirmed by senior Ornithologist Gurpartap Singh that this is a Blue-and-white flycatcher.

3.1. Previous records from Indo-subcontinent region

Tim Inskipp and Sherub, ornithologist also confirmed Blue and white flycatcher presence from Bhutan and considered as the first record from the Himalayan region; Bhutan. Previously, it was reported only from India and Sri Lanka. After the confirmation of observation, it includes four countries and now Pakistan is also enlisted in the Indian subcontinent. According to Clement [10], described the Blue-and-White Flycatcher as a passage migrant through southern and southeastern China between early or mid-December to mid-February and returning to its breeding sites through Guangdong from mid to late March (Figure 1). The Blue-and-white Flycatcher has also been recorded from Sri Lanka's Sinharaja Rainforest Table 1. These records from the Indo-subcontinent highlight the Blue-and-white Flycatcher migration pattern which is also given in the figure 3 where it is also compared with 3 other closely related species in detail [5].

Table 1. Previously recorded sightings of Blue-and-white Flycatcher *Cyanoptila cyanomelana* from the Indo-Subcontinent regions include Pakistan, India, Sri Lanka, and Bhutan.

Sighted Location	Date of Observation	Source
Mehrano Wildlife Sanctuary, Sindh	11 January 2025	This publication
Jigme Singye Wangchuck National Park at Dimba Village (27.4190N & 90.4690E) under Tangsibji Block in Trongsa District, Bhutan	14 April 2018	[5]
Ganeshgudi, Dandeli WLS, Karnataka	07/08 March 2015	[25, 26]
Sri Lanka's Sinharaja Rainforest	2014	[5]
Alibag, Maharashtra	10 March 2012	[24]
Kalipur (13°13'N, 93°02'E) just three kilometers from Saddle Peak National Park in North Andaman Island	05 March 2012	[2]
Tamhini, Pune, Maharashtra	12 March 2011	[3]
Upper Siang District, Arunachal Pradesh	24 November 2002	[27]

Table 2. Summary of key field characters of Blue-and-white flycatcher, Zappey's flycatcher, ultramarine flycatcher, and Tickell's blue flycatcher for the comparative morphology

	Blue-and-white flycatcher *(Cyanoptila cyanomelana)*	**Zappey's flycatcher** (*Cyanoptila cumatilis*)	**Ultramarine flycatcher** (*Ficedula superciliaris*)	**Tickell's blue flycatcher** (*Cyornis tickelliae*)
				
Bill	Bill black; eyes large, especially noticeable in the plain face of female/juvenile; irides black; tarsi black	Average bill width: 5.83 mm (similar across subspecies: intermedia, *cyanomelana, cumatilis*)	Short and black, adapted for insectivorous feeding	Slender Black with a broad base and pointed tip, adapted for insectivory
Head	16–17cm in length; 25g weight. Males have silvery blue foreheads and vivid blue upperparts from crown to tail. The female is simple, with rufous and brown tones. In females and juveniles, the eyes are prominent	Deep cobalt-blue head brighter than Blue and white flycatcher. Females exhibit a similar grayish brown head	Vivid ultramarine blue on the crown, with a distinct white supercilium (eyebrow stripe) in males. Females have a duller, brownish-gray head with faint bluish hints	Males have a bright blue head and lighter tone with rufous breast and white belly. Females grayish head with faint blue tinges with paler orange breast
Underparts	Male: Face, throat, breast, and sides black; belly, vent, and sides to tail base pure white. Female: Olive-grey neck and breast; off-white belly and vent. Intermedia male has deep blue face to breast and flanks, greenish gloss on throat	White underparts with black/blue-green upper border (central China); high contrast with upperparts in Japan and Russia populations	Males display a white patch extending from the throat through the breast to the belly. Females have whitish underparts with possible greyish-brown mottling on the breast sides.	Males possess rufous throats and breasts with white on the belly; females have paler underparts.
Greater Coverts (Adult male)	Shining deep-blue upperparts including wing-coverts with blue outer fringes to tertials, secondaries, and primary bases. Wing-coverts mentioned as part of plumage description	Blue-green with possible fine black streaking (central China); bright blue (Japan); intermediate blue (Russia); streaking rare outside China	Slate-blue, consistent with the upperpart's coloration	Bright blue, consistent with the upperparts
Greater Coverts (immature)	First winter/first-year male resembles female but has blue wings, rump, and tail. Fringes to tertials and flight-feathers more pronounced in juveniles	Not specifically detailed; likely less distinct and less contrasting	Juveniles exhibit buff tips on the greater coverts, providing a scalloped appearance	Scaly brown with blue on wings and tail
Mantle	*C. c. intermedia* lacks the purple tinge on the neck and mantle that is present in *C. c. cyanomelana*. Neck and mantle coloration varies between subspecies	Blue-green with black streaking (central China); rich blue with rare scapular streaks (Japan); intermediate tone, rare streaks in mantle (Russia)	Deep blue in adult males; greyish-brown in females and immature birds	Bright blue in adult males; duller blue in females

Continued Table 2.

Rump	Male: Blue rump. Female: Rufous on rump and tail. First-year male has blue rump and tail. Intermedia shows pale grey flanks	Blue-green with streaks (central China); bright blue (Japan); medium blue (Russia)	Similar to the mantle- deep blue in males and greyish-brown in females	Bright blue in both sexes, though more vivid in males
Uppertail-Coverts	Deep blue in males and rufous in females	Blue-green with fine black streaking (central China); bright blue (Japan); intermediate blue (Russia)	Continuing the upperparts' coloration- deep blue in males; may have a bluish tinge in females	Bright blue, matching the rump and upper tail
Undertail-Coverts/ Tail	Male has blue tail with pure white sides to tail base	Blue tail; all specimens show white at bases of the sides of the tail	Males have slate-blue tails with white bases on the outer tail feathers in western populations; eastern males may lack these white patches. Females possess greyish-brown tails	Blue in both sexes; males may exhibit a more vibrant hue
Morphological Differences	*C. c. intermedia* differs from *C. c. cyanomelana* in coloration: turquoise or azure-blue upperparts with greenish gloss, aquamarine face and breast, and white center to tail base. Females of intermedia are generally darker or more rufous-brown	Distinct populations: Central China (cumatilis): Blue-green, streaked, little contrast between breast and upperparts; Japan (cyanomelana): Glossy black throat/breast, bright blue upperparts, high contrast; and Russia (intermedia): Matt-blackish with bluish wash, intermediate blue upperparts, some contrast	Dimorphic: males are characterized by vibrant blue and white plumage, while females are more subdued with greyish-brown tones. Western males typically have a white supercilium and white bases on the outer tail feathers, whereas eastern males may lack these features	Males are brighter with vivid rufous; females duller; juveniles-streaked brown with blue only on wings/tail.
Plumage Contrast	Adult male shows stark contrast with deep-blue upperparts and pure white underparts. Females are more uniform, with pale to mid-brown above and off-white below. Intermedia males have greenish-blue tones replacing black and less contrast overall	Low in cumatilis (central China) High in cyanomelana (Japan) and intermedia (Russia)	Males exhibit a stark contrast between the deep blue upperparts and white underparts. Females display a more uniform greyish-brown plumage with less pronounced contrast	Males' blue upperparts and rufous breast; females more subdued
Size Differences	Size remains similar across subspecies: length 16-17 cm, weight around 25 g. No significant size difference noted between *C. c. cyanomelana* and *C. c. intermedia*.	*Cumatilis*>*cyanomelana*>*intermedia* in wing length; *cumatilis* has the longest tail; bill widths nearly identical across all	Both sexes are similar in size, measuring approximately 10 cm in length, which is somewhat smaller than a sparrow.	Both sexes are similar in size, approximately 11–12 cm in length
IUCN Status	**Least Concern (LC)**	**Near Threatened (NT)**	**Least Concern (LC)**	**Least Concern (LC)**

3.2. Current observation

In this study, wildlife Photographers (Ali Raza Talpur, Mir Muhammad Hussain Talpur, Zoulfiqar Talpur, Zaheer Abbas Talpur, and Ghulam Ali Talpur) found an odd bird; Blue-and-white Flycatcher (*Cyanoptila cyanomelana*), while busy in catching the insects on the tree *Ficus religiosa* on 11 January 2025, (GPS coordinates: 27 18 16 N 68 41 09 E) from the Mehrano wildlife sanctuary, Khairpur mirs (Figure 2). The groups' attention was drawn to the distinctive sound of a bird [16-18] and found four Blue-and-white flycatchers with the striking features royal blue upperparts, white belly, and Black face and throat (Figure 6). This migratory songbird, belongs to the family Muscicapidae, and is predominantly found in East Asia, with its breeding range extending across Japan, Korea, and northeastern China (Figure 1). For the observation, the bird was frequently flying and capturing the insects, a characteristic feeding strategy of flycatchers. Photographic evidence and field notes were taken to confirm the identification. Photographs were shared on social media platforms and later on discovered by ornithologists of Pakistan; a new record from Pakistan which was previously reported only from India, Sri Lanka, Nepal, and Bhutan (Table 1, Figure 6) but for now this notable record adds a significant new chapter to the Avifaunal diversity of Pakistan and enhances our understanding of bird migration patterns in South Asia. The flycatcher's preferred habitats include forests, woodlands, and gardens, making Mehrano an ideal sanctuary for this rare vagrant species [16-18]. The bird was closely assayed by available field guides and key characters were distinguished among Blue-and-white flycatcher, Zappey's flycatcher, Ultramarine flycatcher, and Tickell's blue flycatcher to clarify the morpho-metric attributes (Table 2).

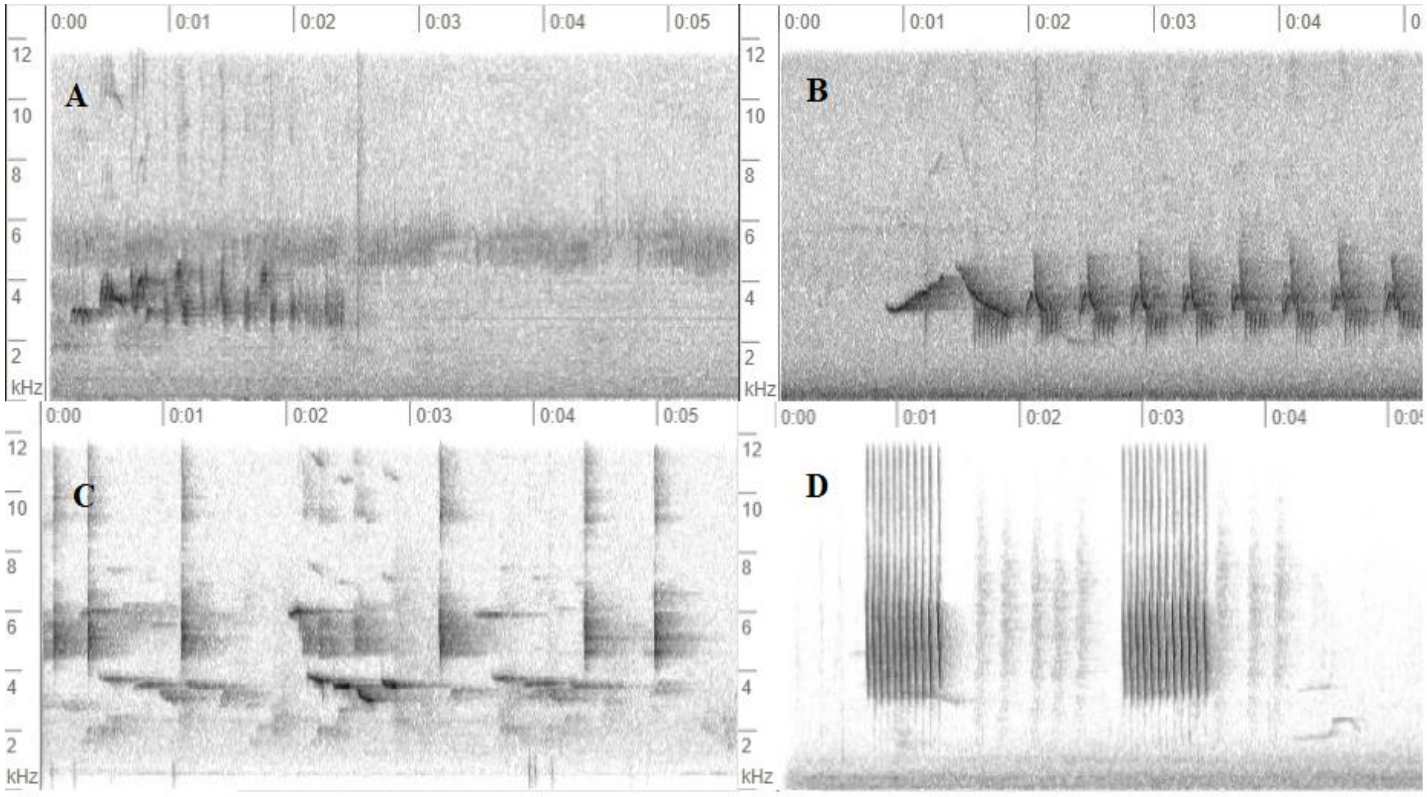

Figure 4. Comparison of Sonogram of four closely related species of Blue-and-white flycatcher (A). Blue-and-white flycatcher (B) Zappey's flycatcher (C). Tickell's blue flycatcher and (D) Ultramarine flycatcher, the sonogram shows completely different sound vocalization which makes it distinguish to other flycatchers.

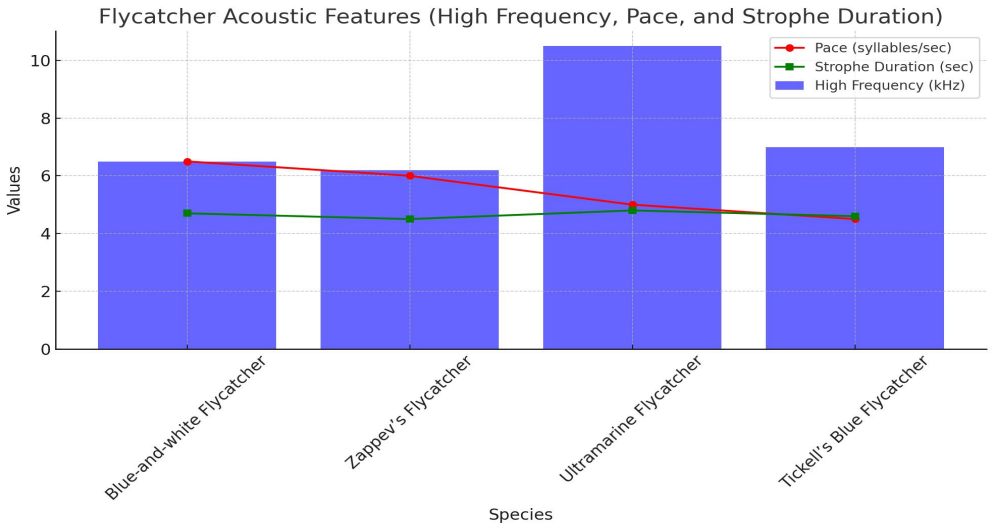

Figure 5. Spectrogram data is visualized and represented in kHz frequency, Pace and strophe of four species. Song morphology was followed [12, 28]. The song strophe divided into trill section, repeated syllables and a brief flourish containing a mix of different syllable types. This song motif parallels to distinguish the birds.

Figure 6. The Photographic record of Blue-and-white Flycatcher (*Cyanoptila cyanomelana)* from Mehrano Wildlife Sanctuary, Sindh.

3.3. Vocalization

Acoustic sonograms were taken from the ebird [22] to validate the confirmation of the Blue and white flycatcher as a new record from Pakistan. Four species were selected to test the acoustic features (Figure 4). The songs of all four species were compared and spectrograms were made on Raven Lite software to show the spectrum of sonogram figure 5 to differentiate among the four species on interspecific variations in high frequency, pace, and strophe duration. The highest frequency exhibited in the ultramarine flycatcher (~10.5 kHz), distinguishing it acoustically from the other species, whereas the Blue-and-white flycatcher demonstrated the fastest vocal pace (~6.5 syllables/sec). Zappey's flycatcher followed closely in both high frequency (~6.2 kHz) and pace (~6.0 syllables/sec), while Tickell's blue flycatcher had the lowest pace (~4.5 syllables/sec) and a moderate high frequency (~7.0 kHz). Blue-and-white flycatcher and Tickell's blue flycatcher have similar high frequencies around 6 kHz, but differ in pace, with Tickell's Blue Flycatcher being slightly faster. Strophe duration remained relatively consistent across all species, ranging between 4.5 and 4.9 seconds which suggests that all species' song phrase duration is similar, species-specific variation exists in frequency and syllable delivery rate that could reflect differences in their ecological behaviors and communication strategies and make it separate to each other in vocalization.

4. Discussion

In this study, we closely reviewed the presence of Blue and white flycatcher from the Indian subcontinent and found nine reports regarding the observation of this bird by [2, 3, 5, 24, 27,29,30,31]. One record also cited from Sri Lanka (Table 1) [32 and 5]. The bird had a deep grey head, and crown with wings, showed a completely blue-colored plumage whereas the mantle and the scapulars showed less pronounced development. The blue color of the back had not become the deep pronounced color seen in adults. The bird exhibited the subtle blue hues on its breast, making immediate identification challenging. Consequently, the authors captured photographs for further analysis (Figure 6). Photographs were shared with Senior ornithologists and literature reviewed with field guides. We tentatively identified the bird as a Blue-and-white Flycatcher, pending confirmation from senior ornithologists, as precise identification can be problematic without prior records and relying solely on photographic evidence [3]. We acknowledge the challenges posed by interspecific variations, climatic variability and the range-specific distribution of the Blue-and-White Flycatcher, which is primarily restricted to East and Southeast Asia (Figure 1 and 3). However, literature indicated that it has been vagrantly recorded in Bhutan, Nepal, Sri Lanka, India, and now Pakistan. Perhaps, a few birds might stopover in various places in the subcontinent's mainland before reaching their breeding grounds while on their return migration. There may be additional undocumented occurrence of migrant species within the country. Therefore, conducting further observations during migration seasons would be beneficial for uncovering such instances. The development of a long-term bird monitoring protocol for Bhutan to ensure the survival of all residents and migratory birds is recommended [5].

According to Barve & Kamath [3], White-bellied Blue Flycatcher (*Cyornis pallidipes*) the endemic species of the Western Ghats looks closely to the Blue and white flycatcher and initially birders, thought it was a plumage variation of the White-bellied blue flycatcher; hence it is likely that this species has been misidentified, or overlooked in the past. The fact that the species is probably present for a short period of the year (in March), and possibly in low numbers, could also be a reason why it was not reported earlier. Clement & Taylor [6], also noticed that *Cyanoptila cyanomelana* at various times in India between mid-December to mid-February, returning to its breeding sites till late March, the timing matches with all the Indian Subcontinent's records. Rajeshkumar [2] also reported a few other records from Andaman & Nicobar Islands during migration, Mugimaki Flycatcher *Ficedula mugimaki* [33], and Blue-winged Pitta *Pitta moluccensis* [34]. Perhaps, regular observations during autumn and spring migration might uncover more such instances. We urge birdwatchers, active along the entire region of Eastern Pakistan to observe the late

migration of vagrant out-of-range birds till the end of late March to April.

5. Conclusion

This finding adds to the increasing amount of evidence indicating changes or extensions in migratory flyways throughout the Indo-Pacific region, in addition to being the first record of the Blue-and-White Flycatcher (*Cyanoptila cyanomelana*) in Pakistan. This species presence in Sindh, which has been documented in India, Bhutan, and Sri Lanka in the past, underscores a larger regional trend of East Asian migrants migrating to South Asia, potentially due to shifting climatic patterns or habitat circumstances. These results highlight the necessity of cross-border data exchange among South Asian nations as well as the significance of coordinated avian monitoring programs across national borders. Tracking migratory routes, confirming sightings, and updating conservation resources like the IUCN species range maps all require teamwork. Despite being classified as Least Concern (LC) at the moment, proactive measures are necessary due to the species dynamic migrations. To sustain both resident and migratory birds, the Sindh Wildlife Department must improve its conservation frameworks at Mehrano Wildlife Sanctuary. This will guarantee that important habitats continue to function as biological refuges in an environment that is changing more and more.

Data availability statement

The data supporting the results of this study can be obtained from the corresponding author upon request.

Conflicts of interest

All authors declare that they have no conflicts of interest.

Ethical approval

Not applicable (N/A)

Acknowledgment

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Authors Contribution

Altaf Hussain Narejo: Conceptualization, original draft writing, and finalization; Ali Raza Talpur: Field data collection, photographic documentation/editing, and data analysis; Mir Muhammad Hussain Talpur: Data curation, investigation, and methodology development; Zoulfiqar Talpur: Conceptual input and manuscript editing; Zaheer Abbas Talpur: Resource provision and funding support; Ghulam Ali Talpur: Manuscript review, editing, and funding contribution; Yasir Pechuho: Species identification and validation.

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