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The bill index: a new criterion to distinguish between the Grey-headed- *Ichthyophaga ichthyaetus* and Lesser Fish Eagles *Ichthyophaga humilis* in photographs

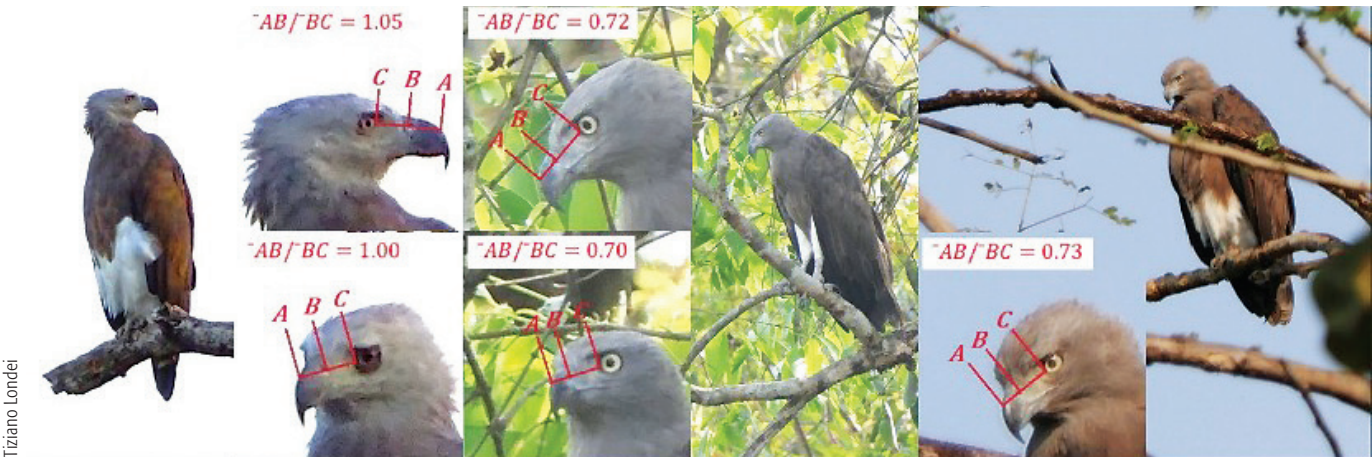
The Grey-headed Fish Eagle *Ichthyophaga ichthyaetus* (GHFE, hereinafter) and Lesser Fish Eagle *I. humilis* (LEFE, hereinafter) show considerable overlap in their wide distribution in southern Asia. Their morphology is so similar that they are often confused with each other in the field. I propose a distinguishing criterion based on bill measurements taken on photographs. This bill index would help better understand the extent of such range overlap and, in perspective, how similar species can coexist close to each other in various habitats.

By providing an increasing number of bird photographs from the field, citizen science offers a powerful tool to gain suggestions for ornithological research. Of course, this tool only works if the subject of the photograph is correctly understood for the suggestive traits, firstly, the diagnostic traits of its species. Despite their being impressive and approachable eagles, widely distributed in southern Asia and showing unique morphological traits (Londei 2020), the GHFE and LEFE have been overlooked in avian studies. These species seem to be sympatric in large parts of their geographic distribution, but their morphological similarity hampers identification where both seem to occur. This problem has a good example in the distribution and ecology of the LEFE, the less studied species. Until recently (Lethaby 2005; Naoraji 2006), its occurrence in India seemed to be restricted to the foothills of the Himalaya, with foraging restricted to small, fast-flowing rivers in forests. Now, it is seen as the commoner species in southern India, previously mistaken for the GHFE in many sites and frequent at the near-stagnant waters of reservoirs (Praveen 2011). Therefore, the habitat preferences might be considered as a provisional guideline, not a distinguishing trait.

In the original description of the LEFE, Müller & Schlegel (1841) pointed to the smaller size to distinguish the new species from the GHFE. For adult birds, they added the less clear tail pattern, lacking the black and white contrast of the GHFE's tail. On the other hand, they remarked on a strong similarity in body shape. Attempts to recognize subspecies complicated later comparisons. For example, Sharpe (1874) saw *Polioaetus plumbeus*, now *Ichthyophaga humilis plumbea*, either as a full species or a subspecies of the GHFE, whereas Gurney (1878) placed it in the LEFE based on the tail pattern, although he noted that large-sized individuals nearly equaled the GHFE in the measurement of the wing. With today's knowledge, vocalizations would be the best criterion to differentiate between the two

species: unlike several images in photo galleries, the sound recordings in Xeno-canto (www.xeno-canto.org) do not suggest any misunderstanding in their identification. The difference in body size is not so great as offering an adequate criterion during field observations, or in the resulting photographs, unless GHFE and LEFEs are seen together. Plumage coloration is the usual criterion. However, published comparisons (e.g., Lethaby 2005) reveal that no colour difference can work alone in every case except for the adult upper tail pattern, provided that the overlying wings let us see this trait in perched birds. When clear-cut traits are unavailable in the field, experts are often able to identify a bird based on its outline. Having seen many photographs and some living birds, I fully agree with Karuthedathu (2023): the rounded head, smaller bill, weaker tarsi, and compact structure with the wing tips almost reaching the tail tip consistently distinguish the LEFE from the GHFE in shape. The last of these distinguishing features is the most obvious, because the counterpart has its wing tips falling well short of the tail tip. This difference, remarked on by Rasmussen & Anderton (2005, both volumes) for the first time, can however be appreciated in perched birds only, and even then, quantifying it considerably depends on the posture of the subjects.

To quantify a shape difference through consistent proportions I tried a new criterion, hereafter called the bill index. On sufficiently clear photographs (not necessarily of the highest quality), I joined the inner corner of the eye to the culmen of the bill with a straight line crossing the nostril at its rear end [222]. The inner corner of the eye is a stable reference point against the small, rotational movements of the eye of raptors, while the rear end of the nostril is the best reference point in the individually variable margins of this opening. I segmented the line where it crossed (A) the culmen, (B) the rear end of the nostril, and (C) the scleral ring at the inner corner of the eye. The length of the culmen-to-nostril segment divided by the length of the nostril-to-eye segment made the bill index. The positions of B and C, critical for the orientation of the line that fixes A, are found with some approximation in low-quality photographs. The bill index is also affected by the orientation of the bird's head, because the true and are on different, intersecting, planes. Despite these drawbacks, GHFE and LEFE showed the difference even when their heads were not in full profile, provided that the head orientation was similar [222]. The GHFE and LEFEs in my photographs are from Sri Lanka and Nepal, respectively. Although GHFEs of Sri Lanka feature the most contrasting grey head in their species, while the LEFE is generally seen as an inconspicuous species for this trait, a confounding similarity would appear in with the LEFE on the right side [222], if only colours were considered. As regional variation in the bill proportions of either species, or both, might reduce their distinctiveness, I validated the bill index with regional comparisons of the two eagles in sympatry. From the Macaulay Library (www.macaulaylibrary.org) I selected photographs of subjects in adult plumage, suitably perched to show the distance between the wing tips and the tail tip. When clearly visible, the upper tail pattern confirmed the species identification. I also searched for the best possible approximation to the full profile of the bird's head. The resulting bill indexes (Table 1) do not suggest any intraspecific regional variation, while the interspecific difference, with no range overlap (1.00–1.09 vs 0.70–0.80), is high enough to make statistical tests redundant. However, an anonymous reviewer of the manuscript tried the bill index with other photographs, a minority of which showed the two species



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222. The bill index of a Grey-headed Fish Eagle (left) and two Lesser Fish Eagle (center and right), with comparable orientations of their heads. Bill index is usually less than 0.80 for Lesser Fish Eagle and greater than 1.00 for Grey-headed Fish Eagle. A minority in both species may approach 0.90.

joining their extreme values at 0.90. Therefore, finding a bill index around 0.90 should make one consider other traits to identify the species.

Table 1. The bill index from photographs of GHFE and LEFE in the Macaulay Library			
Catalogue number	Region	Fish-eagle species	Bill index
ML614994449	N India	GHFE	1.05
ML627857022	N India	GHFE	1.04
ML630906081	N India	GHFE	1.00
ML634028298	N India	GHFE	1.04
ML613265974	N India	LEFE	0.78
ML617847581	N India	LEFE	0.80
ML620496287	N India	LEFE	0.75
ML430401111	S India	GHFE	1.09
ML628233564	S India	GHFE	1.00
ML631424420	S India	GHFE	1.05
ML594799621	S India	LEFE	0.80
ML603037841	S India	LEFE	0.74
ML608400163	S India	LEFE	0.80
ML615662324	S India	LEFE	0.74
ML205870191	Indochina	GHFE	1.06
ML617124289	Indochina	GHFE	1.08
ML548333801	Indochina	LEFE	0.70
ML580586251	Indochina	LEFE	0.80
ML608468791	Indochina	LEFE	0.73
ML189139891	Borneo	GHFE	1.07
ML211862711	Borneo	GHFE	1.00
ML602595041	Borneo	GHFE	1.05
ML626900928	Borneo	GHFE	1.04
ML628750109	Borneo	GHFE	1.04
ML608736428	Borneo	LEFE	0.70
ML612160244	Borneo	LEFE	0.78
ML612976000	Borneo	LEFE	0.70

Hoping that the bill index is confirmed as a practical, as well as consistent, criterion, I would add three considerations to stress the interest in trying it. (1) Young birds are even more

difficult to differentiate based on plumage colours, variable with age and perhaps more similar between, than within, species. The few photographs I found suitable for the bill index suggest that it also works for juveniles (e.g., 0.90 for ML629071523, a GHFE, vs 0.72 for ML226413371, a LEFE) as long as they are of comparable age, because a GHFE still developing its bill might give an index even lower than an older LEFE. (2) Adult LEFEs vary considerably in grey plumage. I photographed the two LEFEs in in March 2025 in the Bardiya National Park, Nepal [222], along the Girwa River (28.495°N, 81.251°E and 28.502°N, 81.250°E), only 850 m between. Their intraspecific difference in colours might add confusion with the sympatric GHFE, which has occurred about three kilometers upstream (iNaturalist 2024). (3) The above example of GHFE and LEFEs found at a short distance in a well-preserved area suggests that this coexistence happens naturally and may have little to do human-caused environmental changes. The forest along the Kinabatangan River, Borneo, offers a further example of the two species (ML628750109, a GHFE, and ML612976000, a LEFE) close together (4.7 km between) in well-preserved environment, in a different climate. In addition, contrary to the usual opinion on which kind of waters each species would prefer, these photographs from Borneo evidence the LEFE at a large river and the GHFE at a small tributary deep in the forest. A more reliable species identification of the GHFE and LEFEs would permit understanding more accurately where they coexist and, in perspective, how they can do so without excessive competition despite so similar morphology.

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Occurrence of the Isabelline Wheatear *Oenanthe isabellina* in the Upper Brahmaputra Valley

The Isabelline Wheatear *Oenanthe isabellina* is a small passerine bird belonging to the Old-World flycatcher family, *Muscicapidae* (Zheng 2002; Outlaw et al. 2010). It is a migratory insectivorous bird breeding in southern Russia, Central Asia, and northern Pakistan. It winters primarily in Africa and north-western India. However, it is also known to occur further east, with scattered records especially on passage, from Nepal, Bhutan, and Arunachal Pradesh in India, and further south from south-western, and southern India, Sri Lanka, as well as Maldives in autumn passage (Kazmierczak 2000; Grimmett et al. 2011; Rasmussen & Anderton 2012). The Isabelline Wheatear breeds in expansive stony plateaus, valleys, gullies and winters in semi-desert with scattered bushes, preferring sandier substrates (Rasmussen & Anderton 2012).

Records of the Isabelline Wheatear in the state of Assam are shown in Table 1 – they have been sporadic in recent years, which may lend to its status as a rare vagrant to Assam. This is the first time the bird has been sighted in the Upper Brahmaputra Valley.

Table 1. Reports of the Isabelline Wheatear in Assam, India

District	Site	Date	Source
Baksa	Manas NP	12 April 2017	Ganpule (2017)
Kamrup Metropolitan	Deepor Beel	12 Mar 2018	Willoughby (2018)
Baksa	Makhibahan Grasslands	18 Mar 2019	Taylor (2019)
Baksa	Manas NP	28 Sept 2022	Choudhury (2022)
Sonitpur	Nameri NP	20 Mar 2024	Byrne (2024)
Golaghat	Kachomari	02 Oct 2025	This work

On 02 October 2025, at 1445 h, a small buff-colored bird was seen perched atop a stump by the banks of river Dhanshiri in Kachomari, Golaghat (26.281°N, 93.982°E). Through a spotting scope the bird's uniformly buff wing-coverts, larger bill, dark lores and lankier vertical stance were some of the telltale features that led us to believe it was an Isabelline Wheatear. Due to the absence of a camera and the bird being distant, we were unable to get truly definitive views of the bird. The bird however got flushed due to roadside disturbance and flew to the shoreline and out of sight. When the bird flushed, it showed a narrow white rump with black central tail feathers and a broader black terminal tail-bar.

We ventured to the same location the next day at 1400 h equipped with photography gear in hopes of finding the bird. After about twenty minutes of relentless scanning, we glimpsed the bird 15–20 feet from us foraging around a heap of cattle dung. Several photographs were taken in proximity that confirmed its identity as an Isabelline Wheatear [223] and the same were cross-checked with several experts. The bird's upright stance showed us it's overall sandy-brown plumage, long dark legs, a

long distinctive supercilium which was wider and whiter in front of eye, blackish loreal eyestripe, almost uniform buff primaries, white rump, and prominent white side of the tail. Much to our surprise we saw another individual along the edge of the road bordering the river. Both birds were moving around in patches of scrubby grass and tracts of gravel. We got to hear the calls of the Isabelline Wheatear for the first time when one individual took flight leaving the other by the lonesome. Its vocalizations can be described as a mix of whistles, buzzes and crackling sounds. The following day yielded no sightings of the birds despite an extensive search by other birders who arrived at the location reinforcing its short window as a vagrant. We hope birdwatchers in Assam will be inspired to look for this bird in similar habitat with sparse scrub and borders of cultivated areas, given it has strayed so far from its usual wintering grounds in the Indian subcontinent.



Vishal Goswami

223. Isabelline Wheatear from Kachomari, Golaghat, Assam.

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