Pycnonotidae: recognize *Pycnonotus porphyreus* (Barusan Bulbul) as distinct from *P. plumosus* (Olive-winged Bulbul)

Evidence in support of elevating Barusan Bulbul (currently *Pycnonotus plumosus porphyreus*) to species-level based on data presented in Cros et al. 2020

Introduction

Bulbuls of the family Pycnonotidae are a group of medium-sized, often drab-plumaged passerines occupying the Old World. They are often forest or forest-edge associated, although a few members of the group are found in urban environments. There are currently 28 recognized genera within the family.

Pycnonotus bulbuls represent the most diverse genus within the family, and are found across most of Asia. Many members of this group have a melodious bubbling song. One member, the Olive-winged Bulbul *Pycnonotus plumosus*, is a forest-edge associated species with a dull greyish head, streaked ear coverts, breast and mantle turning olive on wings, olive-brown breast, flanks and vent and a lighter throat. It is found across Sundaland.

Here, we propose recognizing Barusan Bulbul *Pycnonotus porphyreus*, currently classified as a subspecies of Olive-winged Bulbul, as a full species on the basis of morphology and genomics.

Table 1 AviList v2025 taxonomy of Olive-winged Bulbul

Common name	Scientific name	Range
Olive-winged Bulbul	***Pycnonotus plumosus***	
	Pycnonotus plumosus plumosus	Malay Peninsula, eastern Sumatra and satellites, Java, Bali, and western and southern Borneo
	Pycnonotus plumosus hutzi	northern and eastern Borneo
	Pycnonotus plumosus hachisukae	Banggi and adjacent islands off northeastern Borneo; Mapun (southern Philippines)
	Pycnonotus plumosus porphyreus	western Sumatra, Nias, Batu, Banyak, and Mentawai islands

Proposed AviList v2026 taxonomy:

Common name	Scientific name	Range
Olive-winged Bulbul	***Pycnonotus plumosus***	
	Pycnonotus plumosus plumosus	Malay Peninsula, eastern Sumatra and satellites, Java, Bali, and western and southern Borneo
	Pycnonotus plumosus hutzi	northern and eastern Borneo
	Pycnonotus plumosus hachisukae	Banggi and adjacent islands off northeastern Borneo; Mapun (southern Philippines)
Barusan Bulbul	***Pycnonotus porphyreus***	
	Pycnonotus porphyreus	western Sumatra, Nias, Batu, Banyak, and Mentawai islands

The Barusan Bulbul has already been recognized as a distinct species by some authorities including Eaton et al. (2021), see below for species account:

Barusan Bulbul *Pycnonotus porphyreus* **E**

L 20 cm. Monotypic. Traditionally included with Olive-winged Bulbul but genomic data, plumage, eye colour and vocalisations support species recognition. Areas of overlap between Barusan and Olive-winged in W Sum unknown, requiring research. Singly or pairs, in woodland, forest, edge. **ID Ad** Similar to Olive-winged but darker, greyer head with dark mottling on crown and nape, contrasting more sharply with olive mantle and wings; white ear-covert stripes more conspicuous; ochre to pale-orange eye. **Juv/Imm** undescribed, but eye colour probably much darker. **Voc** Song: 1-2 well-spaced low introductory notes, followed by short burst of ~5–7 mixed, fruity, slightly scratchy, deflected notes, "wip–wit–wit-wip-wit-wip-wip", lasting 2 s. Call: scratchy "wip". **SS** In areas of potential contact with Olive-winged Bulbul in W Sum, see ID section for separation. From other dull *Pycnonotus* and *Iole* bulbuls by more olive wings, greyer (less brownish) crown, and presence of whitish streaks on ear-coverts. Barusan's eye is warmer-colored (less pale-greyish) than in Cream-vented and Buff-vented, and much paler than in Asian Red-eyed and Spectacled. See Buff-vented for additional differences.

Morphology and plumage

- Adult eye colour in Barusan Bulbul is pale (ochre to pale orange), strikingly different from other Olive-winged Bulbul taxa which have dark red eyes. Juvenile eye colour is also lighter (see photos here and here).

- Head darker than in all other Olive-winged Bulbul taxa, giving the light ear coverts a more conspicuous appearance

- Mantle is darker olive than all Olive-winged Bulbul taxa

- No difference in wing nor bill length from Olive-winged Bulbul taxa

- Analysis of museum specimens from West Sumatra (=Barusan Bulbuls) concluded that underparts are darker and more brownish than other Olive-winged Bulbul taxa (Cros et al. 2020).

JAMES A. EATON

Plate 6. Barusan Bulbul *Pycnonotus [plumosus] porphyreus*, Siberut, Indonesia, January 2014. Compared to Plate 7, note the pale orange iris and darker brown head and upperparts, providing more contrast with whitish streaks on the ear-coverts.

Plate 7. Olive-winged Bulbul *Pycnonotus plumosus*, Jelutong Tower, Singapore, January 2014.

FRANCIS YAP

Figure 1: screenshot from Collar et al. (2022) depicting morphological differences between Barusan Bulbuls (top) and Olive-winged Bulbul (bottom)

Figure 2: Specimens of Barusan Bulbul and Olive-winged Bulbul. From left to right: Barusan Bulbul: Barus, Siberut, Sipora, North Pagai; Olive-winged Bulbul: Rimbo Panti (West Sumatra), Pekanbaru (Riau), Way Kambas (Lampung), Jabung (Lampung)

Note that the eye color listed for the North Pagai specimens is brown, instead of the paler orange characteristic of other island populations of Barusan Bulbuls (though still not red) - however, no field sightings in recent times are able to confirm this. Perhaps we shouldn't over-interpret this North Pagai observation given we have no confirmation of this.

All media related to the Barusan Bulbul taxon on the Macaulay Library can be accessed here.

Our measurements of morphometric parameters of Barusan and Olive-winged Bulbuls (bill length, bill height, gape, wing (natural) length, and tail length) show that the former is slightly larger but not significantly so, with measurements generally overlapping between the two taxa.

Bioacoustics

- Bioacoustic differences are described qualitatively but not has not been analysed quantitatively. Barusan Bulbul is reported to deliver ''5–7 mixed, fruity, slightly scratchy, deflected notes…lasting 2 [seconds]' compared to the '3–5 uprising [notes] lasting <1 sec or a longer series of 10–15 notes lasting 2 sec' of *plumosus*' ([Rheindt et al. 2020], Eaton et al. 2021)

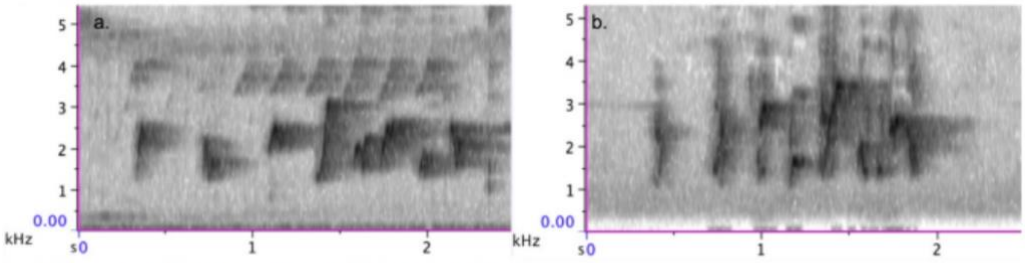
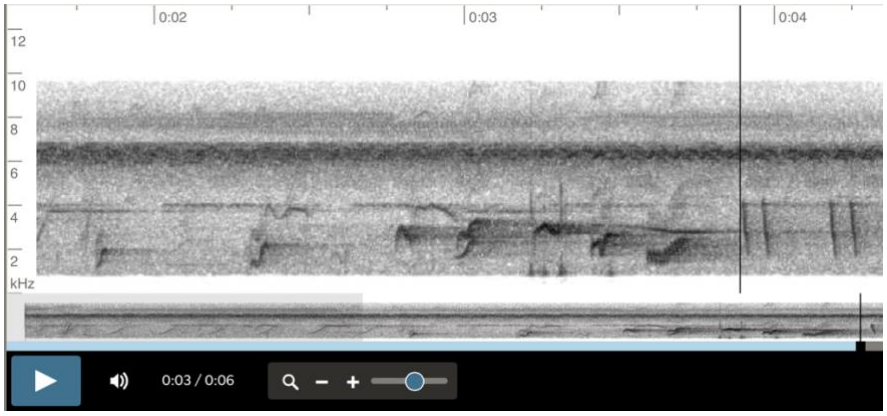


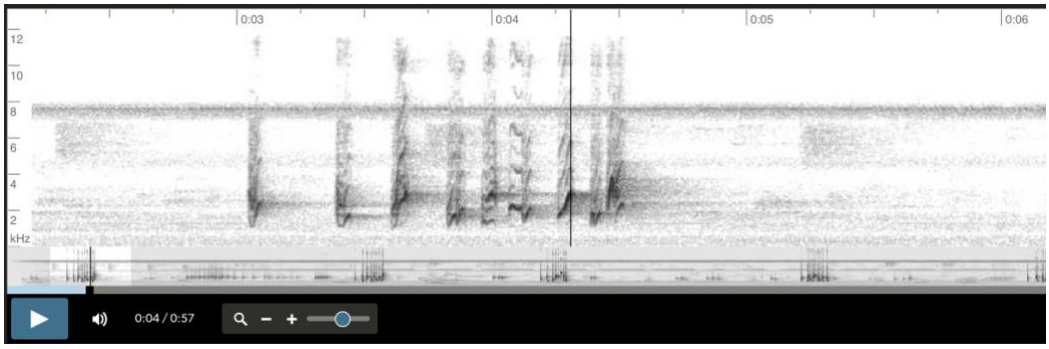
Fig. 12. Sonograms of typical vocalisations of Olive-winged Bulbul *Pycnonotus plumosus*. a, *porphyreus* from Bawolato (Xeno-Canto accession: XC482233; recordist: Frank E. Rheindt); b, *plumosus* from Singapore (Xeno-Canto accession: XC175831; recordist: Lars Buckx).

Figure 3: screenshot from Rheindt et al. (2020) of sonograms showing bioacoustic differences between Barusan Bulbuls (left) and Olive-winged Bulbuls (right)

A typical example of Barusan Bulbul song is here (7 notes, including two introductory notes): https://macaulaylibrary.org/asset/341119011

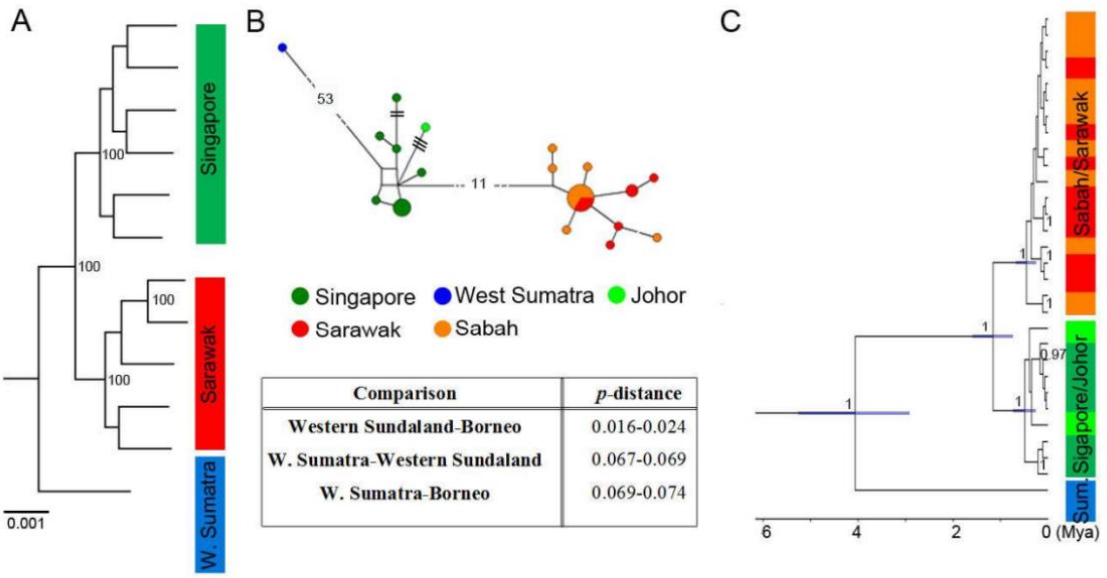


A typical Olive-winged Bulbul recording can be found here (9 notes): https://macaulaylibrary.org/asset/654109177 - note that several recordings show the longer series of notes that is sometimes produced (unknown in Barusan Bulbul): https://macaulaylibrary.org/asset/638212603



Genomics

Genome-wide data (based on 18,072 SNPs harvested using DDRadSeq) suggests that Barusan Bulbuls are deeply diverged from Olive-winged Bulbuls. The *porphyreus* taxon (=W. Sumatra in the tree) is basal to other *plumosus* taxa in both the genomic and mtDNA phylogeny, with high bootstrap support (Fig. 4). The mtDNA divergence data suggests over 6% genetic divergence from Sundaic and Bornean Olive-winged Bulbuls, corresponding to a divergence in the late Pliocene over 3 million years ago (based on a mitochondrial clock rate of 2% per million years).



Comparison	*p*-distance
Western Sundaland-Borneo	0.016-0.024
W. Sumatra-Western Sundaland	0.067-0.069
W. Sumatra-Borneo	0.069-0.074

Figure S10 Phylogenomic analysis of *Pycnonotus plumosus*. A: Maximum likelihood phylogeny based on genome-wide data (outgroup *Pycnonotus brunneus* removed). Only bootstrap support values ≥ 90 are shown; B: Median-joining haplotype network and pairwise distance based on ND2 gene. Hatch marks indicate a difference of one base pair (large differences expressed by numbers); C: Phylogeny based on ND2 with Bayesian posterior probabilities. and node bars indicating 95% HPD. (see Supporting information Tables S1 and S2 for sample ID and information).

Figure 4: Phylogeny from Cros et al. (2020) showing the Maximum Likelihood tree based on genome-wide SNPs (panel A) and a haplotype network (panel B) and Bayesian phylogeny (panel C) based on mtDNA. Barusan Bulbuls correspond to 'W. Sumatra' in blue).

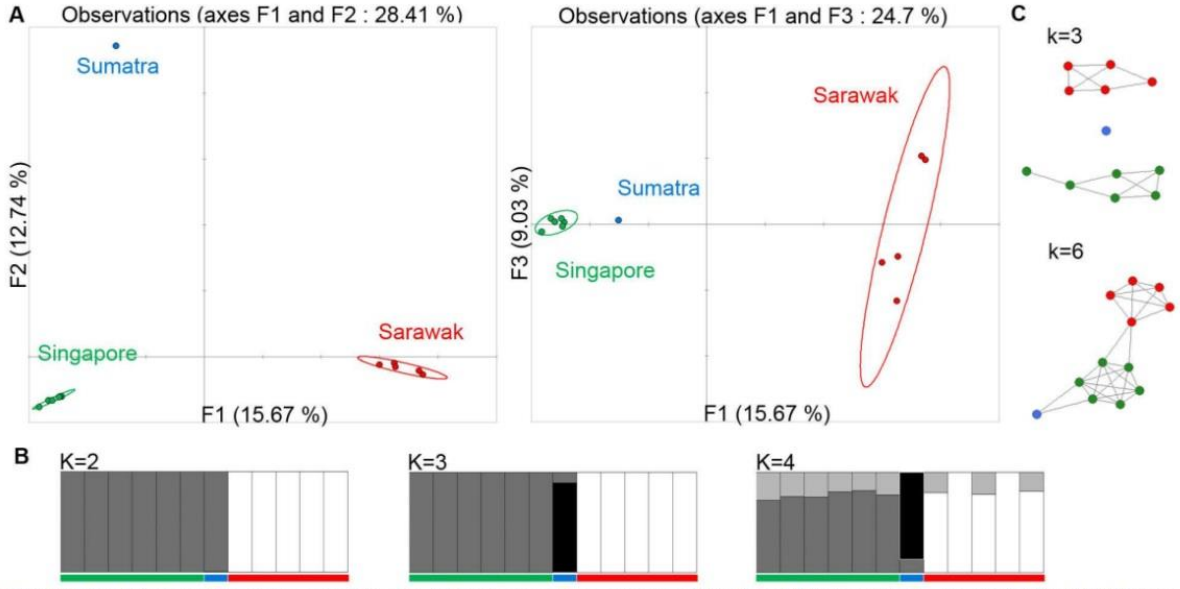


Figure S6 Population structure of *Pycnonotus plumosus*. A: Principal component analysis of SNP data with 95% confidence ellipses; B: STRUCTURE analysis at optimal K=4 from Evanno et al.'s (2005) method and at K=2 and K=3; C: Population clustering based on Netview analysis at k=3, 6, 9. Network plots correspond to k values of first connection between previously separated populations. Color labeling as in Figure S2. (see Supporting information Table S1 for sample ID and information).

Figure 5: Population genomics of *Pycnonotus plumosus* (including Barusan 'Sumatra' sample) based on genome-wide SNPs as analysed in Cros et al. (2020): PCA results (panel A) for axes F1 and F2 (top left) which explain 28.4% of the variation seen in the data and for axes F1 and F3 (top right), which explain 24.7% of the variation seen in the data. STRUCTURE results (panel B) at an optimal division of k=4, at which the Sumatran sample appears as distinct from both Sundaic and Bornean samples.

Similarly, the PCA and STRUCTURE plots also re-iterate the deep differentiation of Barusan Bulbuls (=blue Sumatran sample in plots) from Olive-winged Bulbul populations in Sumatra and Singapore (Fig.

5). Note that the apparently deeper divergence of Sarawak samples in Fig. 5 is likely an artefact of having only a single sample representing the Sumatran population (both PCA and STRUCTURE are sensitive to sample size artefacts – see Fig. 4 in comparison which shows the Sumatran sample as being most basal to the rest).

Biogeography

Barusan Bulbuls known to occur in west Sumatra 'Barusan' islands and adjacent west Sumatra. The two species are parapatric (Eaton et al. 2021: Fig. 6). Olive-winged Bulbul is a lowland Sundaic species which frequent degraded forests and forest edges. Barusan Bulbul occur along almost the entire western side of Sumatra, in coastal woodland habitats on or adjacent to Barusan islands. As the species complex are birds of lowland degraded habitats, they do not have the opportunity to meet along almost the entire stretch of western Sumatra due to the Barisan mountain range being above the known elevational limit of both taxa (Fig. 7-8).

However, in northernmost Aceh, Barusan Bulbul is found almost to the northernmost point of Sumatra, photos are available here and here (Fig. 7). While just 30km to the east, red-eyed, pale bodied Olive-winged Bulbuls are found, as can be seen here. There is no evidence of any intergradation / hybrid zone, though much of the flatland between in this 30km gap is the urban landscape of Banda Aceh.

Other areas of overlap between Olive-winged and Barusan Bulbuls in West Sumatra are alluded to in Eaton et al. (2021). The closest known specimen (Fig 9) of Olive-winged Bulbul to Barusan Bulbul populations is from Rimbo Panti, located in Pasaman Regency, about 50 km from the coastline, an area of lowland forest that slices through the Barisan Mountain Range, https://maps.app.goo.gl/zvxepCTuv9QzJXdg7 (though Mount Talakmau, at 2,919m is situated between here and the coastline that Barusan Bulbul inhabits). The Rimbo Panti specimen has particularly light underparts (a possible example of character displacement) and a clean white throat compared to the Siberut specimen, as well as red eyes (Fig. 9) – typical of Olive-winged Bulbul. The Rimbo Panti population is about 150–165 km from the known Barusan Bulbul populations in Lumbuk Minturun and Rimba Ecolodge, respectively.

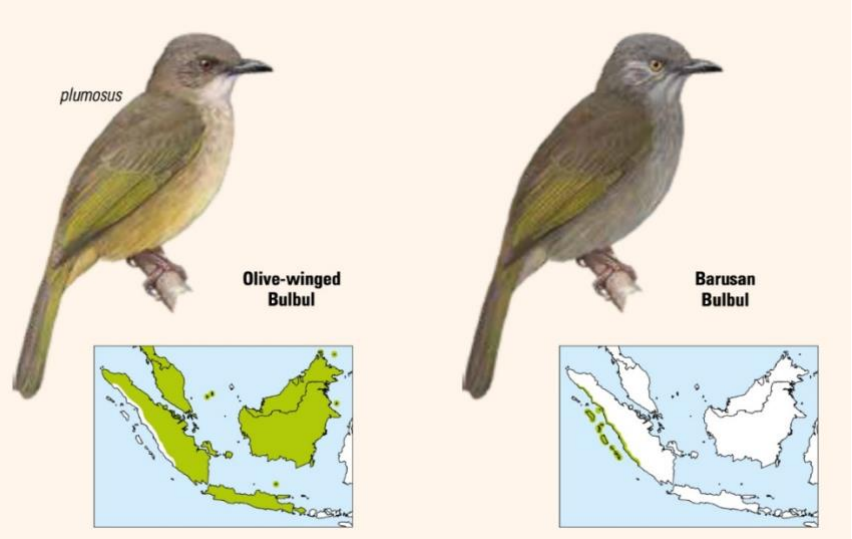


Figure 6: screenshot from Eaton et al. 2021 showing range of Olive-winged and Barusan Bulbul. Note that the distribution shown for both species is now better known, and the former is not known along the western coastline in the very far north, while it is now known to be occupied by Barsuan Bulbul.

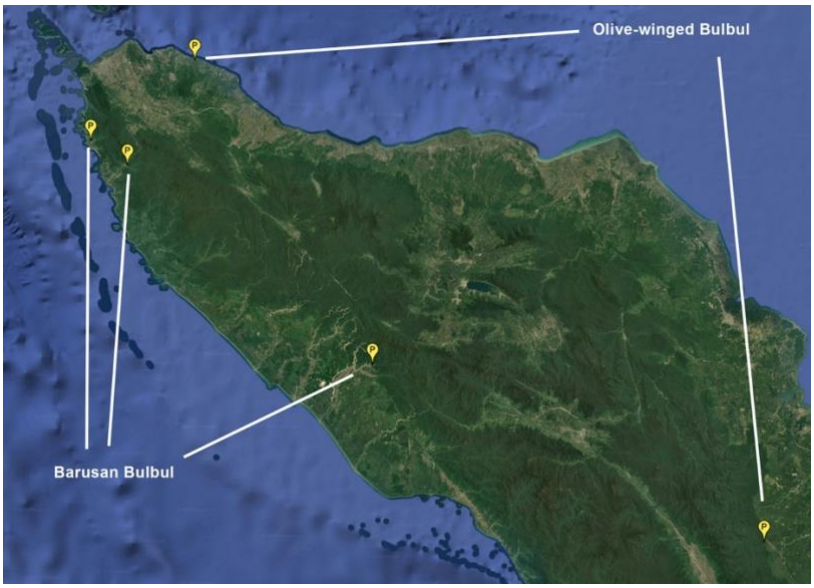


Figure 7: Screenshot from eBird Sumatra, showing rich media of 'olive-winged bulbul' records from Aceh province. Note records of Barusan Bulbul all to the west of the Barisan mountain range, and Olive-winged Bulbul to the east. Despite records being just 30km apart, no sign of intergradation.

Figure 8: Screenshot from eBird Sumatra, showing rich media of 'olive-winged bulbul' records, the Barisan Mountain range neatly splitting apart the taxa.

Figure 9: Olive-winged Bulbul from Rimbo Panti (left) and Barusan Bulbul from Siberut (right).

Yardstick

Eye colour of *Pycnonotus* bulbuls is increasingly recognized as an important trait for species delimitation, and seems to have been under-appreciated by taxonomists in the past. See excerpt from Cros et al. (2020) below:

In contrast to the babblers, plumage differences were generally slight to nondiscernible in canopy bulbuls, in which eye colour becomes a more important trait. Eye colour has been shown to be of central taxonomic importance and sometimes the only obvious phenotypic character differentiating closely related bulbul species (Fishpool & Tobias, 2018; Garg et al., 2016; Shakya et al., 2019).

For example, Cream-vented Bulbuls (*Pycnonotus simplex*) in Borneo were believed to have two eye colour morphs (pale and red) until genomic analysis revealed that the pale-eyed form actually constituted an undescribed cryptic species Cream-eyed Bulbul *P. pseudosimplex* (Shakya et al. 2019).

Similarly, Ayeyarwady Bulbul *P. blanfordi* (with dark-red eyes) and Streak-eared Bulbul *P. conradi* (with off-white to dark-grey eyes) were previously considered conspecific until genomic analysis revealed that they are deeply diverged genomically (Garg et al. 2016), despite limited differences in vocalisations.

Aceh Bulbul (*P. snouckaerti*) was split from Orange-spotted Bulbul (*P. bimaculatus*) based on very different morphometrics, despite minor difference in vocalisations. From Eaton and Collar (2015), regarding potential differences in song of Aceh Bulbul from Orange-spotted Bulbul: 'Its song is similar in structure and pattern to that of *bimaculatus*, being a very staccato, sharp, loud strophe building to a twice-repeated triplet, lasting c.3 seconds, chrrp chrrp pipipip-WÍtoto-WÍtoto-tó, but it has a dry reedy or metallic quality, the first notesrolling or fricative; whereas *bimaculatus* (with *tenggerensis*) produces more open, vowel-like notes, richer and more thrush-like, the first more bubbling than rolling, the climax notes less like triplets: wup up udup upupup-WÍto-WÍtodidu-dó. This distinction is considered constant (JAE), but without acoustic analysis, probably only useful when a larger sample of both taxa is assembled, we refrain from allowing it more than a score of 1.' This species pair geographic boundary is not fully understood, due to the terrain and lack of field studies in the potential contact zone in northern Sumatra (Eaton and Collar, 2015) (Fig. 10).

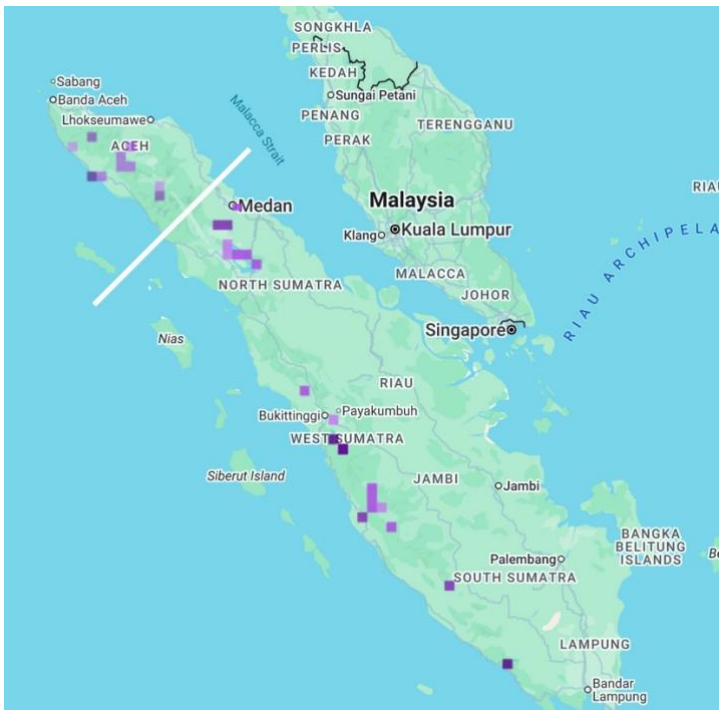


Figure 10: Range of Aceh Bulbul (above white line) and Orange-spotted Bulbul (below white line) on Sumatra (eBird). Despite occurring in the highlands, The intervening area, Gunung Leuser National Park, is still little-known as to what occurs in this mountain range due to lack of field observations.

Many *Pycnonotus* species vary little in bioacoustic differences between closely related species. The 'Black-crested Bulbul' complex for example, was split by Fishpool and Tobias (2005) based on plumage differences, despite the five species having virtually identical calls. For example, two of the Indonesian species, Ruby-throated Bulbul *P. dispar* and Bornean Bulbul *P. montis* have only minor plumage differences and nearly identical vocalisations (Fig 11). This arrangement—originally made based on external morphology—has since been affirmed by molecular data (Shakya & Sheldon 2017).

From Eaton et al (2021):

Ruby-throated Bulbul song: 3–8 variable, cheery "wee-wit-it-weet" notes, first 2 notes downslurred, remaining notes inflected, sharper than Bornean Bulbul.

Bornean Bulbul song: 3–5 cheery "wee-wit-it-weet" notes, first note downslurred followed by inflected notes.

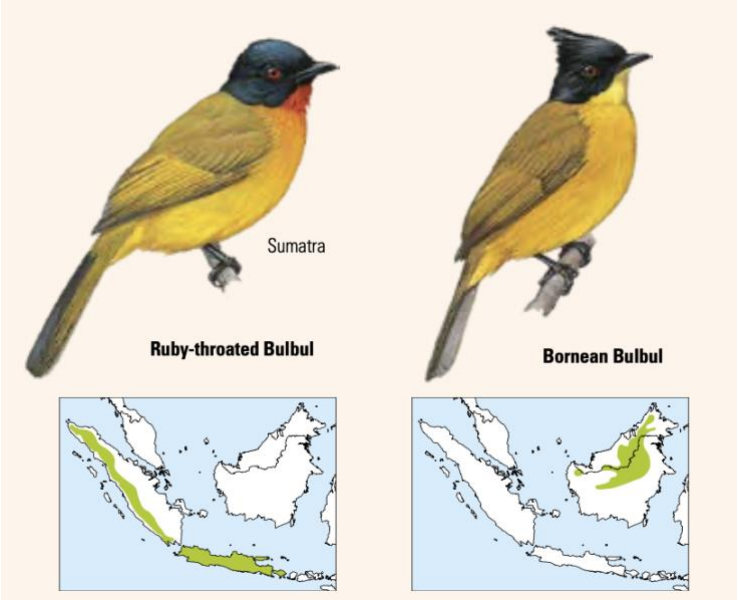


Fig 11: despite very minor bioacoustical differences, Ruby-throated Bulbul and Bornean Bulbul were split based on minor plumage differences, but was later backed up by genetic evidence.

There are also other Bulbul genera in Asia such as the *Iole* genus. Here, Charlotte's Bulbul (*Iole charlottae*) has been split from Buff-vented Bulbul (*I. crypta*) based on deep mtDNA and minor vocal differences (despite not obvious morphological differences), following Manawatthana et al. 2017. Indeed, in Eaton et al (2021), vocalisations of Buff-vented Bulbul are described as 'Similar to Charlotte's but notes typically exhibit greater bandwidth, making them sound more nasal and fractionally higher-pitched.' – far less distinct than Barusan vs Olive-winged Bulbul. See TaxCom discussion here: https://github.com/aviantaxonomy/Taxonomic-Proposals-v2025/issues/752

Conclusion

The Olive-winged Bulbul *Pycnonotus plumosus* is a dispersive forest edge species, and genome-wide analysis reveals evidence of recent gene flow (probably during cycles of land connectivity during the Pleistocene) between populations in western Sundaland and Borneo (Cros et al. 2020). This connectivity highlights the peculiarity of identifying a genomically diverged taxon Barusan Bulbul (*Pycnonotus plumosus porphyreus*) in close geographic to the Western Sundaic population, but with divergence estimates placing the last gene flow with other Olive-winged Bulbul populations during the late Pliocene.

Given the deep genetic divergence (distinct grouping based on genome-wide SNPs and >3 million year divergence from Olive-winged Bulbuls estimated based on mtDNA) and the morphological distinctions (particularly in eye color), supported by the bioacoustics differences (on-par with other recognized *Pycnonotus* species) and ranges, Tropical Asia RAG proposes recognizing Barusan Bulbul as a separate species from Olive-winged Bulbul.

References

Collar, N.J., Berryman, A.J., and Donald, P.F., 2022. Taxonomic changes proposed for Asian birds in 2021. BirdingASIA, 38: 37-49.

Cros, E., Chattopadhyay, B., Garg, K.M., Ng, N.S., Tomassi, S., Benedick, S., Edwards, D.P and Rheindt, F.E., 2020. Quaternary land bridges have not been universal conduits of gene flow. Molecular Ecology, 29(14): 2692-2706.

Eaton, J.A., Jearwattanakanok, A., Sa-ar, I, Van Balen, B. and Goh, W., 2024. Cream-eyed Bulbul Pycnonotus pseudosimplex: cryptic Borneo endemic or hiding in plain sight? BirdingASIA, 42: 78–85.

Eaton, J.A., Van Balen, B., Brickle, N.W. and Rheindt, F.E., 2021. Birds of the Indonesian Archipelago. Greater Sundas and Wallacea. Second edition. Lynx Edicions, Barcelona, Spain.

Eaton, J.A. and Collar, N.J., 2015. The taxonomic status of Pycnonotus bimaculatus snouckaerti. Forktail, 31: 107-110

Fishpool, L.D.C. & Tobias, J.A. 2005. Family Pycnonotidae. In del Hoyo, J., Elliott, A. & Sargatal, J. (eds) Handbook of the Birds of the World, Vol. 10: 124–251. Barcelona: Lynx Edicions/Birdlife International.

Manawatthana, S., P. Laosinchai, N. Onparn, W. Y. Brockelman, and Round, P.D., 2017. Phylogeography of bulbuls in the genus Iole (Aves: Pycnonotidae). Biological Journal of the Linnean Society, 120: 931–944.

Shakya, S. B. & Sheldon, G. H. 2017. The phylogeny of the world's bulbuls (Pycnonotidae) inferred using a supermatrix approach. Ibis 159: 498–509

Shakya, S.B., Lim, H.C., Moyle, R.G., Rahman, M.A., Lakim, M. and Sheldon, F.H., 2019. A cryptic new species of bulbul from Borneo. Bulletin of the British Ornithologists' Club, 139(1): 46–55.

Appendix

The Barusan Bulbul was first described in 1912 by Oberholser as a subspecies of the Olive-winged Bulbul:

PYCNONOTUS PLUMOSUS PORPHYREUS, new subspecies

Like *Pycnonotus plumosus plumosus*, but darker, especially on the upper parts.

Type.—Adult male, No. 180019, U. S. N. M.; North Pagi Island, November 23, 1902; Dr. W. L. Abbott.

Collar et al. (2022) also recommended that Barusan Bulbul should be recognized as a distinct species:

Pycnonotus plumosus porphyreus* = *P. porphyreus

Expanding on the summary of this taxon by Rheindt *et al.* (2020), who noted it was 'deeply distinct', Eaton *et al.* (2021) separate 'Barusan Bulbul' *P. porphyreus* (Plate 6) of the Barusan Islands (and, to an extent currently unknown, adjacent western Sumatra) from the pan-Sundaic Olive-winged Bulbul *P. plumosus* (Plate 7). They document a number of morphological differences between the two, namely that Barusan Bulbul is 'darker with dark mottling on crown and nape, contrasting more sharply with olive mantle and wings; white ear-covert stripes more conspicuous; ochre to pale-orange [*vs* dark red] iris'. They also note that *porphyreus* diverges acoustically, delivering '5–7 mixed, fruity, slightly scratchy, deflected notes…lasting 2 [seconds]' compared to the '3–5 uprising [notes] lasting <1 sec or a longer series of 10–15 notes lasting 2 sec' of *plumosus*. To this they also suggest that unpublished genomic data (see Rheindt *et al.* 2020) support their conclusion.