



## Final Report

Exploring the Enigma: Identifying Key Distribution and Threats of Black-browed Babbler (*Malacocincla perscipillata*)

### ABSTRACT

Following the rediscovery of Black-browed Babbler after being missing for 172 years in 2020, we conduct preliminary research to figure out the species distribution, general ecology, and behavior, possible population, and threats to its existence in its habitat in Kotabaru Regency, Kalimantan Selatan Province. We found out that this babbler is almost certainly a karst specialist, with limited distribution to the karst mesa to the east of Meratus Range. We discuss the possible population, ecological requirements, behavior, and conservation status of the species based on our observations, and call for more research and conservation measures to ensure its existence.

## Contents

A. Background .....	2
B. Objectives .....	2
C. Methods.....	3
1. Date and Location .....	3
2. Data Collection.....	3
3. Data Analysis .....	5
D. Result and Discussion .....	7
1. Distribution .....	7
2. Ecology and Behavior.....	10
3. Evidence of Possible Threats and Conservation .....	15
4. Additional Results .....	17
F. Conclusion.....	17
G. Recommendation .....	18
H. Acknowledgment.....	18
Bibliography .....	19
APPENDIX 1 Schedule .....	21
APPENDIX 2 Funding Detail.....	23
APPENDIX 3 Birds of Eastern Meratus Karst Formation .....	26
APPENDIX 4 Bird Trade around Meratus Range .....	31
APPENDIX 5 Documentation.....	35

# Final Report--Exploring the Enigma: Identifying Key Distribution and Threats of Black-browed Babbler (*Malacocincla perscipillata*)

## A. Background

The Black-browed babbler is formerly only known by a single specimen collected somewhere in Kalimantan Selatan between 1842-1848 (Collar 2014), before its spectacular rediscovery by songbird trapper in late 2020 (Akbar et al. 2020). There is only limited information regarding this species' ecology, much of which is based on assumptions surrounding the circumstances of the type specimen and some notes from around the rediscovery site (Akbar et al. 2021). This makes the Black-browed Babbler one of the least known birds in Asia, and it is currently classified as Data Deficient (DD) by IUCN (BirdLife International 2021). There is a high likelihood that the population size of the Black-browed Babbler is small and localized, and the species may be in immediate danger of extinction (Akbar et al. 2020, 2021).

The record shows that the majority of species that are rediscovered after long hiatuses are usually acutely threatened, or are subject to a rapid deterioration in their conservation status (Scheffers et al. 2011). Being the longest missing species in Asia, the situation is likely to apply to the Black-browed Babbler—especially with the large-scale deforestation and land conversion into oil palm plantations in and around the rediscovery location, and which is expected to pose a significant threat to this species. Moreover, the captured individual was initially to be sent to a local bird market in South Kalimantan, which indicates poaching and songbird trading a potential threat for Black-browed Babbler (Akbar et al. 2021).

To determine the status of Black-browed Babbler's population and conservation strategies to save it, a survey regarding its population and ecology is urgently needed. However, without any data on the species' distribution or habitat preference, it is difficult to determine what actions need to be taken to conserve this species. Given these very large knowledge gaps, there is an urgent need for fieldwork to better understand the conservation status of the species to plan future work. Through this project, we hope to build the evidence base on the ecology and status of this poorly known species, and pioneer outreach to local stakeholders as foundations for long-term conservation work targeting the Black-browed Babbler.

## B. Objectives

The objectives of the project are as follow:

1. To identify key sites in the Black-browed Babbler's distribution in Kotabaru Regency, Kalimantan Selatan
2. To better understand the Black-browed Babbler's general ecology, habitat needs, and behavior
3. To identify threats faced by the Black-browed Babbler

## C. Methods

### 1. Date and Location

The survey was divided into two phases: a recce visit and the main field survey. The visit was originally scheduled in July 2021 for the recce visit and then in September 2021 for the main fieldwork, interspersed by a whole month of the permit application process in August. However, due to the circumstances around the COVID-19 pandemic, including the fact that some of our team members contracted the disease just before our departure and have to self-isolate, the visit was pushed back into September-October 2021 for both phases. The complete survey schedule can be seen in the table attached in Appendix I.

The survey location was concentrated in the area around the rediscovery site in Kelumpang Hulu District, Kotabaru regency. We spend a week of recce visit and then three weeks of the main survey in the location, before expanding the search into some different sites for another three weeks to verify their presence/absence in the other side of the Meratus range. In the end, we visited a total of 7 different sites as follow:

- a) Eastern Meratus Karst Formation, an area full of limestone karst mesa/butte (hill with steep, almost vertical cliff on the side and relatively flat top) to the east of Meratus Range in the mainland part of Kotabaru Regency, the majority are in the Kelumpang Hulu district, where the Black-browed Babbler was rediscovered in 2020. It is can further be divided into three separated formations: (i) a crescent formation in the southwest from Mantewe District, Tanah Bumbu Regency to Pelaju Baru Village in Kelumpang Hulu, (ii) a big formation full of steep limestone karst towers in the north ranging from Cantung River to Sungai Durian district, and (iii) a narrow line formation in the southeast elongated from Mantewe District in Tanah Bumbu Regency to Hampang District.
- b) Teluk Kelumpang Nature Reserve is a conservation area dominated by mangrove forest but also include a forested hill near Kelumpang Bay.
- c) Gunung Raya is an area full of forested hills with some karst base and part of the main Meratus Range.
- d) Bajuin is a village near Pelaihari town with forested karst hill.
- e) Sultan Adam Forest Park, a conservation and tourism area near Banjarbaru city with several types of habitat including lowland forest and hill forest; is identified to be the as the sites most likely to be the last strongholds of Black-browed Babbler by BirdLife International (2001) before the rediscovery.
- f) Gunung Batu Hapu, a forested limestone karst tower to the west of Meratus Range.
- g) The area around Loksado village, including Gunung Kentawan Nature Reserve, is a forested hill with some karst habitat in the heart of the main Meratus Range.

### 2. Data Collection

#### a. *Opportunistic Searching*

Due to the terrain, it is not possible to do a standardized survey using line-transect or pre-determined point count. Instead, presence points were collected by opportunistic searching across different habitats twice a day, one in the morning (6 AM-10 AM) and one in the afternoon (2 PM-5 PM). In each survey, observers walked systematically around 3-5 km, stopping every 300-500 meters to play the audio recordings of Black-browed Babbler for five minutes, followed by five minutes of careful listening. Every sighting location (both visual and

aural) was recorded using GPS devices as 'Presence point', while, locations where our calling attempt that did not provide any visual or audio responses was recorded as 'Absence Point'.

To determine general habitat and niche, observers also recorded some key information including the substrate/perching high where the babbler was first seen, a present/absent list of key habitat features (i.e. presence of cliff face, human track, lianas, undergrowth, etc) in 10 meters radius of each sighting, as well the common habitat types that were classified as in Tabel 1. Observers keep observing the babbler after the initial sighting to note for any notable behavior data, including the numbers of individuals and prey/food species (when seen feeding). We also collected sound recordings and video footage of Black-browed Babbler in every opportunity, as well as the location of every evidence of trapping, hunting, logging, land cover change that we encountered during the survey.

Habitat Type	Details
Karst Hill Primary Forest	DBH of trees in 10 m radius >1 m, located on or near (<50 meters) from any visible limestone hill/cliff.
Karst Hill Secondary Forest	DBH of trees in 10 m radius must be <1 m, located on or near (<50 meters) from any visible limestone hill/cliff.
Lowland Primary Forest	DBH of trees in 10 m radius must be >1 m, located on flat surface >50 meters from any visible limestone hill/cliff.
Lowland Secondary Forest	DBH of trees in 10 m radius must be <1 m, located on or near >50 meters from any visible limestone hill/cliff.
Shrub	<3 trees with DBH >30 cm in 10m radius, with open canopy
Palm Oil Plantation	Habitat dominated by oil palm in 10 m radius
Edge	Edge habitat between all habitats mentioned above

*Tabel 1 Habitat type classification*

#### *b. Passive Acoustic Monitoring*

To increase study area and sightings, we employed Passive Acoustic Monitoring using three AudioMoth acoustic loggers in the second quarter of our survey, after we were confident that we have understood the majority of Black-browed Babbler's vocal repertoire. Each recorder was set to record a 50-seconds recording every minute between 5 AM to 7 PM and installed for 3-5 days in different recording stations. Each recording was then inspected manually using Audacity® software to see if any Black-browed Babbler song or call was recorded.

Likewise, every recording station that managed to record at least one vocalization of Black-browed Babbler was recorded as 'Presence Point', while those that did not were labeled as 'Absence Point'. We also recorded a present/absent list of key habitat features from the immediate vicinity of the recorders (<10 meters), including cliff face, human track, lianas, and undergrowth. The time of each recorded song and call was also noted.

### *c. Bird Market Survey*

We visited 13 bird markets and bird shops around the Meratus range to collect evidence of the Black-browed Babbler being traded, including the Pal 7 Bird Market which is the biggest bird market in Kalimantan Selatan province. Data on other species that were traded in the market were also collected. In the event when Black-browed Babbler was present, we interviewed the seller regarding the bird's origin and relative demand from the hobbyist. We carefully phrase our question to the seller regarding Black-browed Babbler to avoid generating a sense of demand for this species.

### *d. Secondary Data Collection*

For secondary data collection, we interviewed 57 people who live around our survey area, with questions regarding if they ever see the babbler (by showing them pictures of the Black-browed Babbler, and then confirmed by showing another picture of other similar babbler and asking them if it is the same species) and general information regarding the habitat around their home. All the locations where the interviewee mentioned that they have seen the babbler and confirmed it not to be a misidentification were then recorded as 'Historical Presence Point'. Finally, we also did a simple interview with local authorities regarding the status of the location used by Black-browed Babbler, history of habitat change, as well as information regarding location with similar habitat to be visited to expand our search for the babbler.

## 3. Data Analysis

### a. Species Distribution Modelling

All presence points that we collected (both from present or historical) were used to train maximum entropy species distribution modeling (Merow, Smith, and Silander 2013; Morales, Fernández, and Baca-González 2017) in MaxEnt v.3.4.4 software (Phillips et al. 2017) to map the area of where the Black-browed Babbler is most likely to occur. The Maxent Modelling was chosen because of its ability to handle small datasets (Aguirre-Gutiérrez et al. 2013) and the option it provides for using imperfect pseudo-absence data to manipulate background processes and reduce the effects of site selection bias (Anderson et al., 2003; Steven J. Phillips et al., 2009; Steven J. Phillips & Dudík, 2008). While we do have true absence data from playback effort, we prefer to use randomly-generated pseudo-absence point (or "background points") due to the resulting presence point being concentrated in a relatively small area on the northeastern side of the Meratus range that we believe illustrate the true range of this species (see Result and Discussion) that we used as the extent of the modeling, and we would like to see more detailed prediction in this particular small area.

We were using 4 environmental predictors for the model, excluding the commonly used bioclimatic variables as it often compromises the finer grain size of biophysical variables which may be more important determinants of species distribution at small spatial scales (Manzoor, Griffiths, and Lukac 2018). The first one is a map of elevation (Jarvis et al. 2008) in 90 m spatial resolution, which we also processed into slope or changes in elevation map that we used as the second covariate. The third one is a map of soil type, categorized based on FAO soil groups category (Global Forest Watch 2019) with 100 m resolution. The last predictor is a map of canopy closure for all vegetation taller than 5 m height by (Hansen et al. 2013) with 30 m

resolution. The feature types of all predictors are set as continuous except for soil type, which is categorical. The model was run with 10,000 background points, with the regularization parameter set to the default value of 1.

#### *b. Population Interpolation*

We used a simple method of manually counting a conservative number of individuals on a single isolated patch of habitat that was visited extensively during the survey, and use it to extrapolate the density and estimate the total population in the species range as determined by Maxent Modelling. The site chosen was Gunung Besar (-3.113032, 115.957655; not to be confused with Mt Besar in the heart of Meratus range), a 1 km<sup>2</sup> limestone hill that were isolated from other limestone formation in a considerable distance and surrounded by oil palm plantation (a habitat we believe to be not suitable for the babbler). The condition of this make it relatively safe to assume that the babbler population here does not change during the survey from local migration, and the relatively small area also makes it easier to count and confirm the number of individuals living in this site through parallel observation by several observers in different site simultaneously.

A standardized population estimation using distance sampling was originally planned, of which we are using the distance between the observer and each bird to extrapolate the population density in each area. However, we decided to abandon this method after witnessing the unobstructive and shy nature of this bird that makes it almost impossible to detect without the help of playback recording (out of 27 direct observations, only one is “organic” without the use of playback). The usage of playback alters the bird’s distance to the observer and compromises the distance sampling method, and thus we believe it is not the best tool for this species.

## D. Result and Discussion

### 1. Distribution

#### a. Occurrence

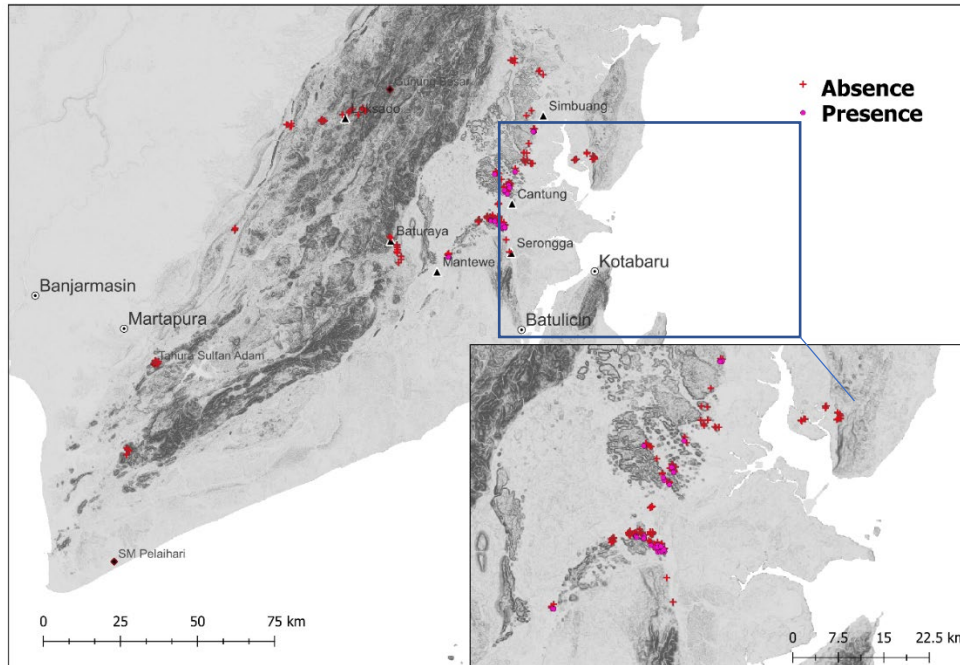


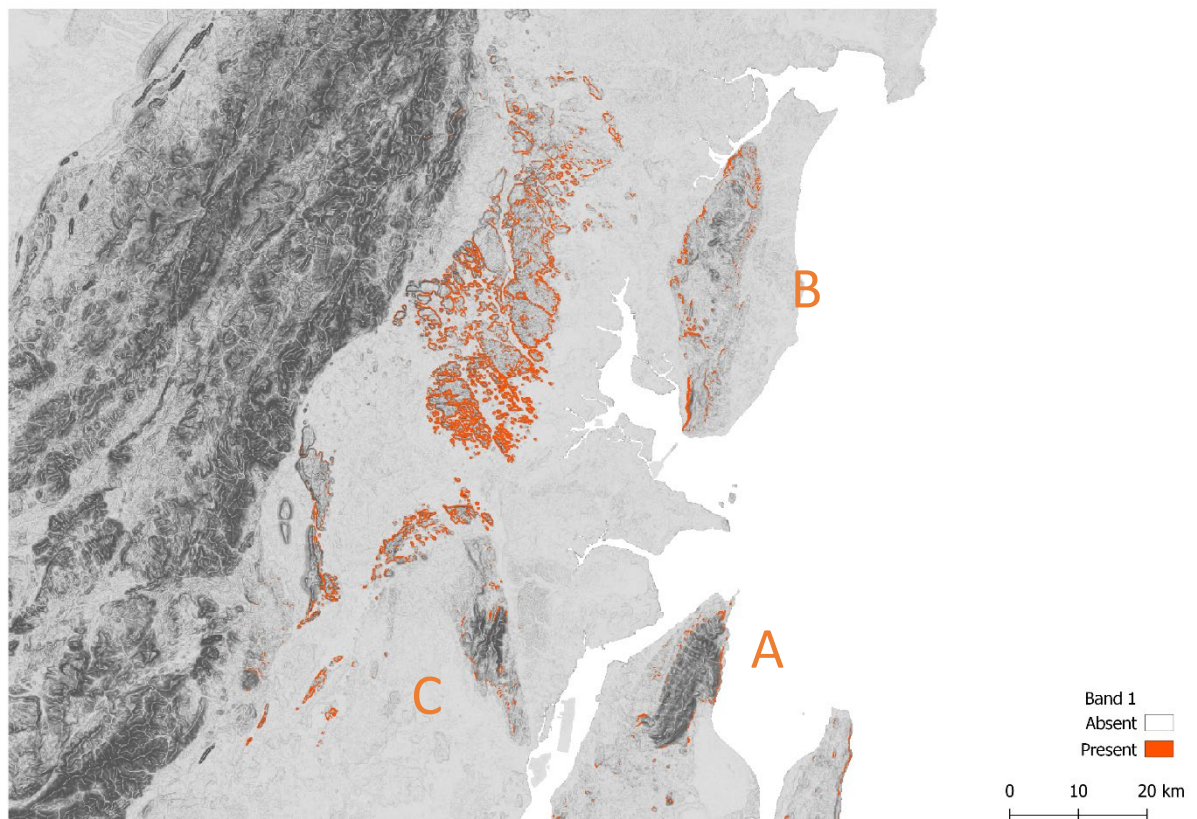
Figure 1 Presence and absence points of Black-browed Babbler.

A total of 30 presence points were collected during the survey, consisting of 27 points using direct observation (18 seen, nine heard only) and three points using Passive Acoustic Monitoring (Figure 1). All Presence points were located in the Eastern Meratus Karst Formation, with no sightings recorded at any other side of Meratus Range. In addition, all Presence Points were located at least 50 meters away from any limestone karst cliff, with 28 of the points being in the immediate vicinity of the cliff (<10 meters). This generally confirmed our suspicion regarding the babbler's limited range to the east of Meratus Range, as well as their preference of rugged limestone karst cliff habitat.

No Historical Presence Points were recorded from interviews with residents around the survey area. None of our interviewees mentioned that they had ever seen the babbler nor were aware of the existence of such species, even when we managed to find the babbler just a few meters from the interview location. Together with the fact that all sightings we made using playback show the relatively unobtrusive and shy nature of this babbler, which may also contribute to the lengthy period of which they were missing in any scientific record.



*b. Species Distribution Modelling*



*Figure 2 Species distribution modeling of Black-browed Babbler, showing possible presence of this species in the East Meratus Karst Formation, reclassified using threshold rule "10 percentile training presence" (0.222).*

While we managed to get 30 presence points, only 28 were usable for modeling due to the predictor's resolution. The resulting model has Area Under ROC Curve (AUC) value of 0.991, which is considered excellent, but further statistical tests to check its performance will be reported in the publication. We reclassified the resulting modeling into a binary present-absent map using threshold value "10 percentile training presence" of 0.222, which provides a more specific prediction of Black-browed Babbler's distribution.

As predicted before, the karst cliff seemed to have significant importance to Black-browed Babbler's predicted distribution. This fact was demonstrated by slope and elevation that became the environmental predictor with the highest contribution to the model, with percent contribution value of 52.8% and 30.3% respectively (Table 2). Soil type has a lower contribution of 14.7%, but canopy closure's contribution is even lower at 2.2% showing its marginal importance to the model. This fact is also demonstrated using jackknife test for all predictors (), with forest canopy closure having the lowest regularized training gain as the only variable and the best gain with it omitted from the model. The jackknife also reveals how the soil type is the only variable resulting in better gain than elevation and slope, but only a slight decrease of gain when being omitted from the model, showing a relatively small amount of useful information that is not already contained in the other variables.

Variables	Description	Resolution	Percent contribution	Permutation importance	Source
Srtm	Digital Elevation Model SRTM	90 m	30.3	38.3	Jarvis et al, 2008
Slope	Slope gradient generated from DEM SRTM	90 m	52.8	52.8	Jarvis et al, 2008
Soil	Indonesia Soil Type based on FAO soil groups	100 m	14.7	0.5	Global Forest Watch, 2014
forest2000	Canopy closure for all vegetation taller than 5m in height in the year 2000	30 m	2.2	0.4	Hansen et al, 2013

Tabel 2 Environmental predictor and its effect on the model

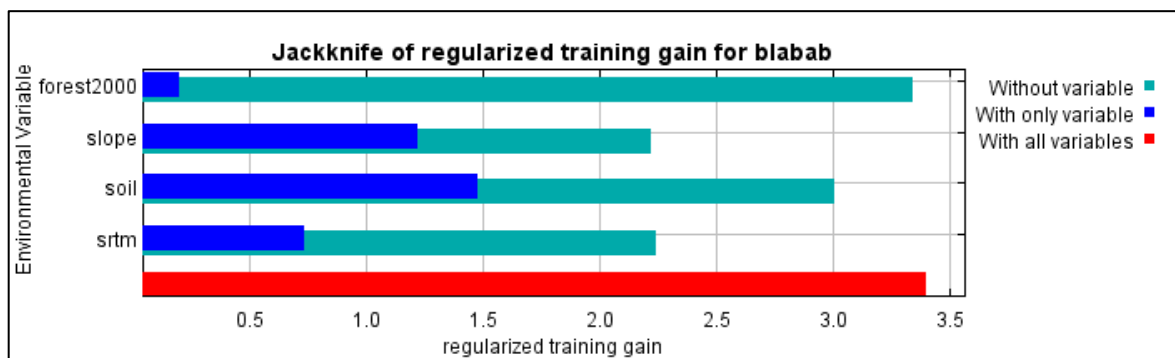


Figure 3 Jackknife test of all variables.

While the model shows possible presence in almost every cliff in East Meratus Karst Formation, the model also predict occupancy in Laut and Sebuk Island (A) which were not included in current research due to time constraint. This area The closest gap between Pulau Laut to Bornean mainland, as well as from Pulau Sebuk to Pulau Laut is less than 2 km, but there were no babbler species has been ever reported from these islands (Davison 1997; Holmes 1997; Kusmana et al. 2017) except Bold-striped Tit-babbler (*Mixornis bornensis*) which is an extremely generalist species (Davison 1997). However, the amount of published ornithological records from this area is very limited and might not cover the full extent of avian diversity in the area (Davison 1997; Holmes 1997). A further visit is needed to confirm Black-browed Babbler's existence in these two islands.

### c. Population Extrapolation

Using parallel observations shows a total of 5 individuals in Gunung Besar, which means a density of 5 individuals/km<sup>2</sup>. The total predicted presence area from modeling is 221.17 km<sup>2</sup> including Pulau Laut and Pulau Sebuk. The maximum possible population is 1106 individuals assuming all predicted areas happened to be occupied, and 553 individuals assuming that only 50% of all predicted areas are occupied. Another scenario is when Pulau Laut and Pulau Sebuk omitted from the area of presence, which resulted in the total predicted presence area to be 203.84 km<sup>2</sup> and the total population of 1019 individuals when all presence area is occupied and 509 individuals when only 50% of the area is occupied.

## 2. Ecology and Behavior

### a. General Habitat and Niche

As mentioned, our observation shows that the black-browed babbler has a strong vicinity towards habitat on/near limestone karst, with 28 out of 30 Presence Points were located within a 10 meters radius from the karst cliff (Figure 1.1). Other features that stood out were shrub, herb, and lianas which presented in almost every presence point, suggesting how the babbler prefers an area with relatively dense forest-floor and mid-level vegetation. Five sightings were located around human track, possibly suggesting their minimum tolerance towards human activity, although this will need more observation and analysis to prove.

Moreover, 21 of these Presence Points were also recorded from the area that we identified as “karst secondary forest” and six from “karst primary forest”. There were two sightings from the edge habitat near palm oil plantation and one sighting from lowland primary forest which may suggest that such habitats were also utilized marginally. However, it is also important to mention that these three sightings are still located within 100 m from nearby karst hill and all were observed using playback, with each bird disappearing right away after the playback was stopped. It is possible that the birds were simply drawn into the edge habitat after hearing the recordings and, such habitat might not be regularly used. Along with the result of Species Distribution Modelling, this generally confirmed the karst hill forest, particularly with secondary and primary growth to be the general habitat for Black-browed Babbler.

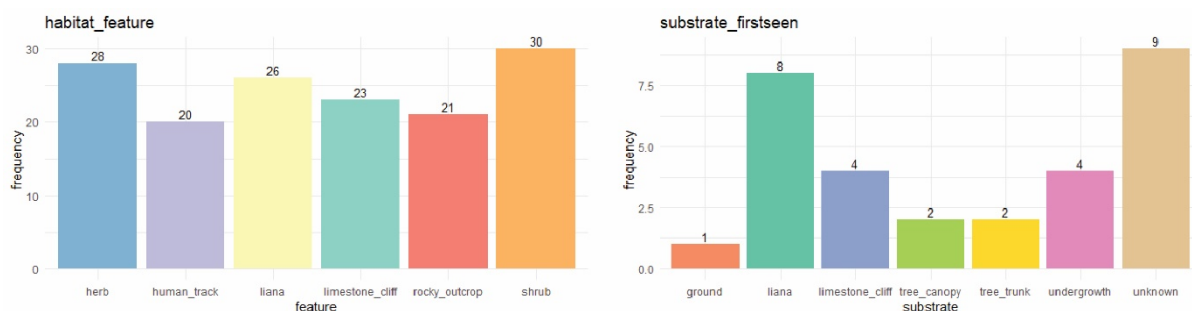


Figure 4 Habitat Feature (n=30) and substrate first-seen (n=21)

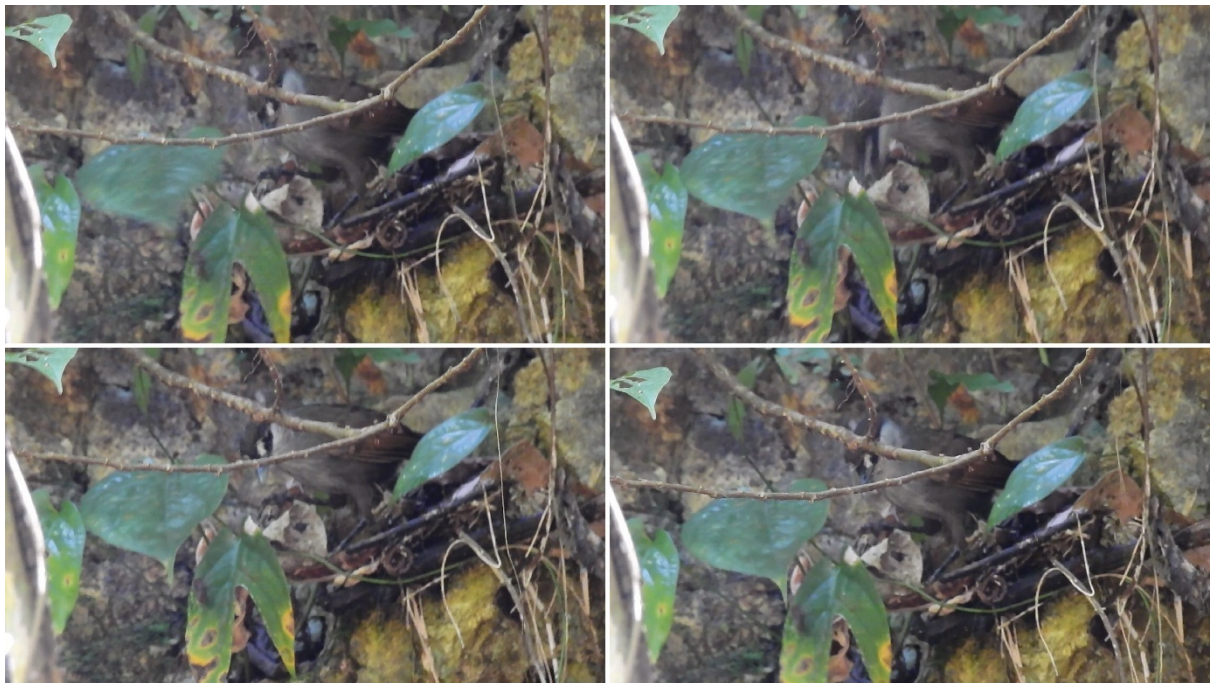
Our “substrate first seen” data, which were the substrates of which the babbler perch in every direct sighting, virtually shows that they prefer to utilize low-to-mid story during their diurnal activity, which virtually is similar to other *Malacocincla* babbler. From 21 direct sightings, the babbler was recorded to perch eight times on liana, four on undergrowth (herbs and shrubs), and four on karst cliff (Figure 1.2). Two sightings from the lower canopy show that they use the higher story as well, but in both cases, the birds were singing in response to our playback, and might not represent a natural behavior.

Observers also noted that the babbler utilizes more ground-level niche for foraging and moving during extended observation after initial sighting; however, due to our method, the amount of time used to utilize this niche was not recorded, and thus not usable to objectively compare the total amount of utilization of each part of vertical niches and to confirm-nor-deny Mees’ (1995) prediction on which the babbler being ‘more arboreal than its congeners’ due to its shorter

tarsus—which were also contradicted with Collar’s (2014) measurement. Our observation still shows that this species is at least utilizing the same niche that other *Malaconcincla* babblers use, possibly in equal proportion.

#### *b. Feeding and Prey Item*

We observed 12 occurrence of feeding behavior during the entire fieldwork; 3 of which we were able to identify the item of the food taken, all of which comprised of invertebrates: aphids (superfamily Aphidoidea), a snail (family Dyakiidae), and a cockroach (order Blattodea). The aphids were taken using a technique known as ‘leaf gleaning’, which comprised the majority of the feeding technique we witnessed in our observation (10 sightings). Both the snail and the cockroach were taken from the ground/cave floor (every 1 sighting). We also observed a bird probing into cluster of leaves-litter, reminiscent of *Stachyris* babbler (Figure 2). All feeding action observed <5 meters of height from the ground.



*Figure 5 Black-browed Babbler probing cluster of dead leaves, reminiscent of Stachyris babbler.*

While our observation is limited, the variety of diet and method of feeding of Black-browed Babbler seems to be similar to other species in its genus, in particular Abbot’s Babbler (*Malacocincla abboti*) which feeding method also involves a significant amount of leaf gleaning (Mansor, et al. 2015). Leaf-litter probing was not reported as one of the hunting methods of Abbot’s Babbler (Mansor, et al. 2015) and thus might be unique in Black-browed Babbler among its genus. The Abbot’s Babbler is reported to always forage under 2-4 meters (Mansor & Mohd Sah, 2012), but we observed feeding action up to 5 meters above the ground on Black-browed Babbler with the leaf-gleaning method, showing a slightly wider range of vertical niche used for feeding.

### c. Vocalization

We recorded 19 files of vocalization from Black-browed Babbler, consisting of 16 direct recordings using handheld recorders, and three recordings from Passive Acoustic Monitoring device. These recordings (Figure 2) can be grouped into two types of individual songs, two types of duet, two subsongs (or whisper song), as well as an alarm call and a presumed dawn song recorded in captivity. Observers also reported loud wing sonation uttered when flying overheard that we were unable to record.

In general, the two types of songs (Figure 2.1-2) can be described as a jumble of slightly whistled and upsurred or downslurred chatter between 1-4 kHz, lasting between 8-10 seconds with a tempo of 2-3 notes/second. Each type has similar phrases but sounded at different order, with a descending and then upsurred note present in both types singed every 2-4 of other notes that might be important for identification. The babbler sings in to respond to the playback on rather high (1-3 meters) and open perches, slightly dropping and flapping the wings in similar fashion to other babbler species (Figure 3).

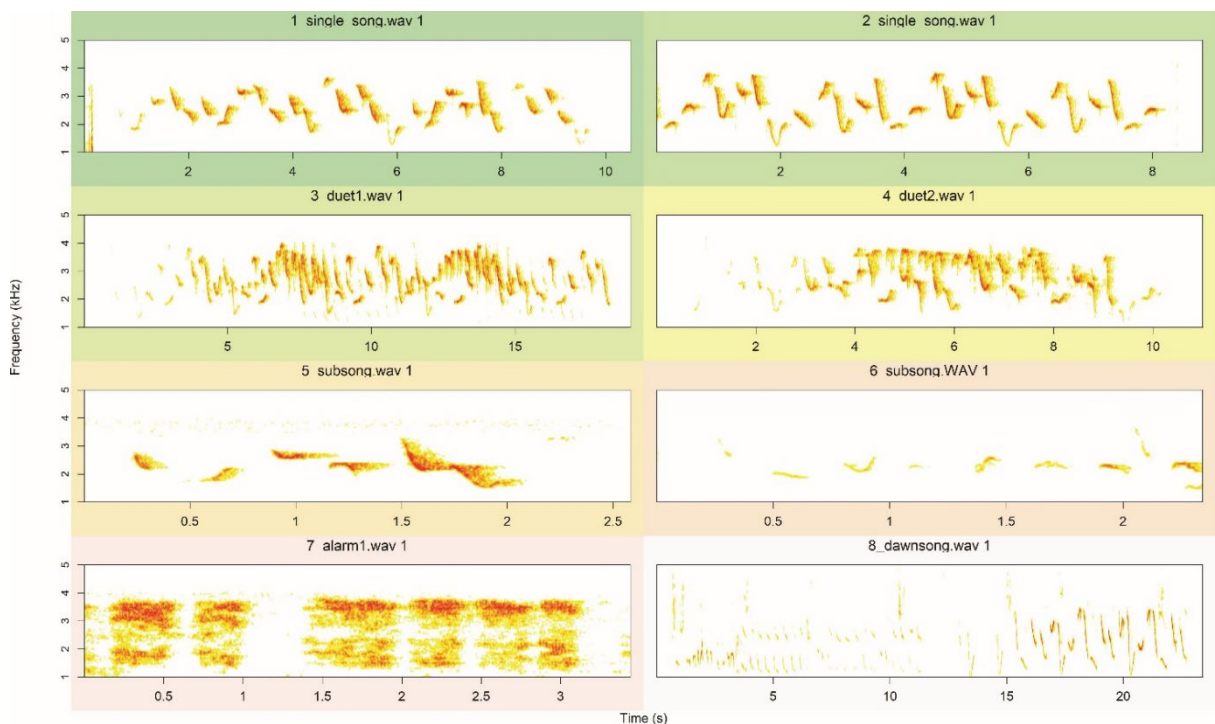


Figure 6 Spectrogram of Black-browed Babbler's vocalization.

The duet (Figure 2.2-4) can last longer up to 20 seconds, with the first bird (presumably male) uttering the same vocalization as both types of the songs. The second bird (presumably female) responded roughly 3-4 seconds into the song, with 8-10 quickly ascending notes from 2 kHz to 4 kHz “pi’pi’pi’pi’PI’PI..” followed by very low and monotone 9-11 notes between 1 kHz to 1.8 kHz “pyow-pyow-pyow”. Similar to the song, the duet was sounded at rather open and high perches, with both individuals slightly dropping and flapping the wings while vocalizing (with the second individual visually flapping its wings more vigorously).

The sub-songs last less than 3 seconds and contain phrases recognizable from both types of song. The first type of sub-song (Figure 3.5) was recorded using our PAM device, and thus not given in response to any playback. The second sub-song was (Figure 2.6) given in a response to playback and uttered before a duet, with the voice of the second individual triggering a switch into a full main song. Both sub-songs were noticeably much shorter and quieter than the main song, and presumably not given by immature since no noticeable plumage differences were observed on the vocalizing bird.

The alarm call (Figure 3.7) consisted of simple rattles typical of Pellornidae babblers. It was given in between songs in response to playback, often while moving between perches looking for the source of playback. We only encountered this vocalization twice during the whole survey, both by a pair that seems to be more agitated than in any other encounter despite the usage of the same playback, possibly indicating an important site (e.g. nest).

The presumed dawn song (Figure 3.8) was recorded from the captive bird recorded by Muhammad Suranto during the initial rediscovery in October 2020, which were omitted from the publication due to communication issue. According to Suranto, the song was recorded very early in the morning, with complicated phrases that were somewhat different from the song we encountered during the survey, which made us believe it to be a different type of song. Given that our survey only run after dawn, and that we never encountered this type of song during our survey or in our PAM instrument, we presumed this vocalization to be a type of dawn song that possibly only uttered during a certain breeding period.

Except for the presumed dawn song, all vocalizations were recorded between 7-11 AM, but these were also heard during direct observation between 1 PM-5 PM, suggesting the babbler can sing anytime throughout the day but possibly prefer to do so in the morning. The songs and duet were mostly recorded during late September, with most birds encountered in mid to late October being quiet and only investigating the source of playback without giving any vocal responses.



Figure 7 Duetting Black-browed Babbler.

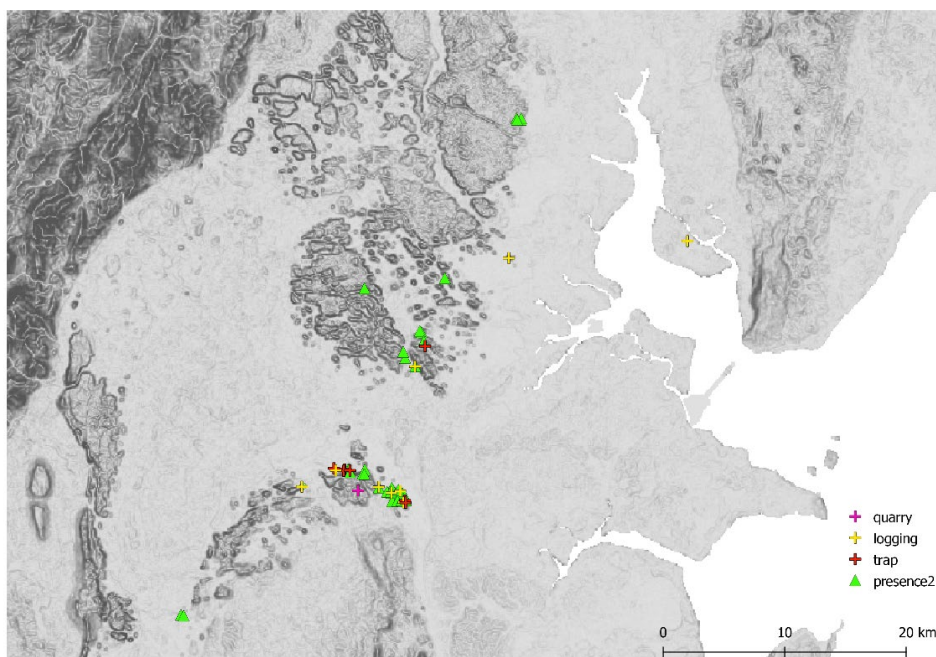
#### *d. Social and Interspecific Behavior*

All sightings of Black-browed Babbler consist of only a single individual (12 observations) or a pair (15 observations). Every sighting observed in late September to the first week of October were a pair; while in the later week of October we saw more single bird in every encounter. We particularly observed this behavior on a pair of birds that live close by our basecamp that always show up aggressively to playback at the beginning of our survey, perching on open places to counter-sing the playback; but in the later date, only one individual came with a subjectively more timid behavior, preferring to skulk in silent and sometimes sounding sub-song. This change of behavior may indicate different stages of the breeding season, with other birds possibly incubating and hence not showing up, or the pair breaking up after the end of a breeding season.

We did not find any evidence of the Babbler joining any mixed-species flock, however, an interesting interspecific behavior we recorded was an immature Plaintive Cuckoo that (*Cacomantis merulinus*) seemingly associated with a pair of Black-browed Babbler on October 18<sup>th</sup>, 2021. The cuckoo was seen following the babbler pair that came after we play the recording, and at one point commencing behavior we believe as begging for food. We did not observe feeding behavior to confirm the suspicion of the babbler being a host for this brood-parasite, and it is also worth to mention the cuckoo's immature plumage may also indicate that it has passed the age of dependency to the host-parent.

We also noticed that there are only two other Pellorneidae babbler co-exist in the same general area of where the Black-browed Babbler are present, both of which does not share the similar niche or habitat characteristic with the babbler: Scaly-crowned Babbler (*Malacopteron cinereum*) which is more arboreal (Eaton et al. 2016), and White-chested Babbler (*Pellorneum rostratum*) which often regarded as river-bank specialist (Collar and Robson 2020) and only observed on a riverine forest on the base of the karst hill. This fact may demonstrate on how Black-browed Babbler outcompetes other undergrowth-loving babblers in the karst area, or if it simply occupied an unused niche by other babblers in this relatively poor habitat.

### 3. Evidence of Possible Threats and Conservation



*Figure 8 Evidence of Possible Threats for Black-browed Babbler.*

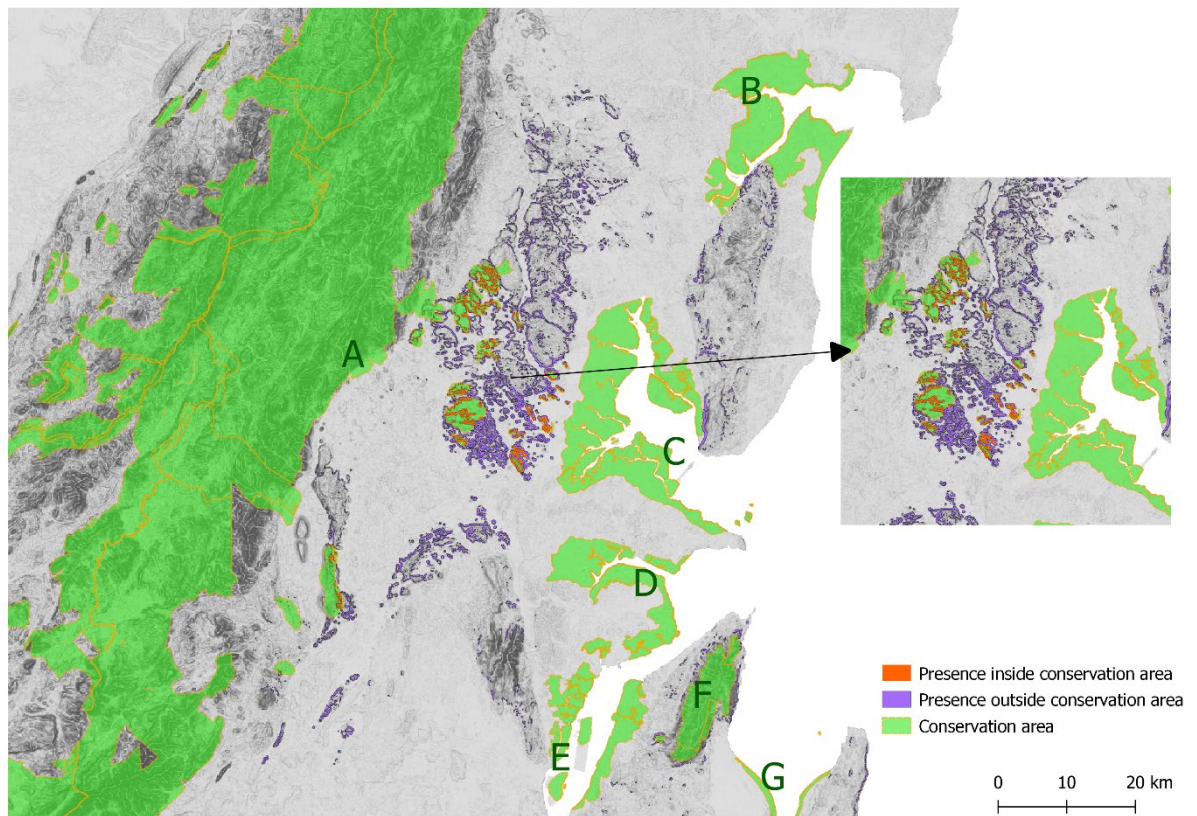
Throughout the survey, we spotted 19 of evidences of possible threat for Black-browed Babbler, which consisted of 8 poaching evidence (remnants of “fly stick” trap), 10 evidence of logging, and 1 open-mining quarry right in the middle of Black-browed Babbler’s habitat. The majority of this evidence was found close by the sighting of Black-browed Babbler, particularly in the crescent-shaped formation to the south of East Meratus Karst Formation. Bird market survey did not result in any individual of Black-browed Babbler being traded. Careful interview with bird seller and poacher does not provide evidence that this bird is being targeted even after massive publicity of its rediscovery—the majority of our interviewees ( $n=39$ ) even does not know any news regarding the babbler, with the remaining only hearing about the name without realizing it was rediscovered in Kotabaru Regency.

While logging is the most commonly encountered possible threat, most of the sites we encountered were relatively old remnants of past logging activity. Together with the fact that the babbler was also observed in secondary forest, this may show the relatively insignificant threat from logging to the species. Similarly, poaching might possess a slightly larger but diminutive threat to the Black-browed Babbler, shown by the fact that the original rediscovery was made by poaching activity although it was not initially targeted either before or after the rediscovery. Our interview with M. Suranto shows that some bird traders were contacting him to get a living specimen of Black-browed Babbler with a price offer of up to IDR 5,000,000 (~USD 347) after initial publicity of its rediscovery, which he rejected. No other offers were made months after the publicity, indicating the market interest in this bird has died off along with the news of this species’ rediscovery.

Forest fires have also been reported from the interview in several areas throughout Black-browed Babbler’s range. Seven interviewees mentioned an isolated hill that has been entirely burned by a wildfire about a decade ago, resulting in a total destruction of its forest habitat, but now relatively well-covered with vegetation with several Black-browed Babbler present in it. This may demonstrate the ability of Black-browed Babbler to re-occupy totally destroyed and isolated habitat in just a decade, which is relatively fast in ecological timescale.



A possibly larger threat may come from habitat destruction, especially from the quarry and other mining activities which may result in total destruction of Black-browed Babbler's habitat in a single area. While there was only one quarry we found that was located close to the Black-browed Babbler's habitat in Kotabaru Regency, expansion may possible in the future (Kwan 2021). This may be further exacerbated by the Indonesian Government's plan to move the capital city from Jakarta to East Kalimantan (van de Vuurst and Escobar 2020), which is expected to accelerate land conversion in the region altogether. Further research is needed to find out the tolerance of this species towards a certain level of habitat change.



*Figure 9 Map of Conservation Area in Kotabaru Regency and Black-browed Babbler's Modelled Presence. A = Hutan Lindung Pegunungan Meratus, B = Cagar Alam Teluk Pamukan, C = Cagar Alam Teluk Kelumpang, D = Cagar Alam Selat Laut, E = Taman Wisata Alam Pulau Burung-Pulau Suwangi, F = Hutan Lindung Gunung Sebatung, G = Cagar Alam Selat Sebuku.*

From 221.17 km<sup>2</sup> – 203.84 km<sup>2</sup> of predicted presence location from our modeling, only 30 km<sup>2</sup> (<15%) is located inside conservation area, namely Hutan Lindung Pegunungan Meratus (Meratus Mountains Protection Forest) under the Forestry Office of Kalimantan Selatan Provincial Government (Figure 10). Using our estimated density of 5 individuals/km<sup>2</sup>, the whole protected area can support 75-150 individuals of Black-browed Babbler in case of total destruction of non-protected habitat. Several other conservation areas were also located adjacent to the presence location, but currently do not include the presence area in its boundaries such as Cagar Alam Teluk Kelumpang, Cagar Alam Selat Laut, Hutan Lindung Sebatung, and Cagar Alam Selat Sebuku. These locations can also be important sites for the conservation of Black-browed Babbler if its boundaries can be adjusted slightly to include the adjacent habitat of this species, and further ensure the safety of its existence in the future.

#### 4. Additional Results

##### a. Birds in Eastern Meratus Karst Formation

During fieldwork, we recorded a total of 133 species of bird in the surrounding areas of the Eastern Meratus Karst Formation, including the Black-browed Babbler itself (see Appendix III). This number includes eight species endemic to Borneo, five introduced species, and five migratory species. From all of these species, two are classified as Endangered, five as Vulnerable, 20 as Near Threatened, and 1 as Data Deficient (Black-browed Babbler) in IUCN Red List.

Some notable records include Black-naped Fruit Dove (*Ptilinopus melanospilus*), which were recorded several times in Teluk Kelumpang Nature Reserve (-2.936158, 116.235512). This is a new record for mainland Kalimantan, as this species was previously only recorded on the islands north of Borneo and Maratua (Eaton et al, 2021) and some vagrant on the mangroves of Sabah (Eaton, *in litt*). Other than in the formation, we also recorded this species in Suwangi Island, Pulau Burung-Suwangi Nature Park (-3.435621, 116.024846) as well as secondary records from local residents in Satui (-3.593113, 115.351469), indicating a more widespread presence of this species in mainland Borneo than what has been previously known.

##### b. Bird Trade around Meratus Range

We recorded 109 species of with a total of 225 individuals bird being sold, including 3 Critically Endangered Species, 6 Endangered, 3 Vulnerable, and 12 Near Threatened, with 14 of which are protected by Indonesian law (see Appendix IV). From these numbers, six taxa (5 species) are known to be endemic to Borneo, including three taxa endemic to Meratus Range, two of which were undescribed taxa: Meratus Jungle-flycatcher (*Cyornis sp nova*) and Meratus White-eye (*Zosterops sp nova*). We also recorded several migratory species being traded including Zappey's Flycatcher (*Cyanoptila cumatilis*) and Siberian Blue Robin (*Larvivora cyane*).

Up to 24 species found are not native nor known visitors to Borneo, with six of which were already widely introduced in the island from the trade itself: Java Sparrow (*Lonchura oryzivora*), Javan Myna (*Acridotheres javanicus*), Streaked Weaver (*Ploceus manyar*), Zebra Dove (*Geopelia striata*), Sooty-headed Bulbul (*Pycnonotus aurigaster*) and Bar-winged Prinia (*Prinia familiaris*). Several taxa were also known to be transported from Wallacea region especially Sulawesi and Lesser Sundas, including Red-backed-thrush (*Geokichla erythronota*), Thick-billed white-eye (*Heleia crassirostris*), and Black-naped oriole race *celebensis* (*Oriolus chinensis celebensis*); suggesting a trade route between these regions to Kalimantan; possibly via Surabaya to Banjarmasin or Makassar to Batulicin.

#### F. Conclusion

Our observation shows that the Black-browed Babbler has a strong affinity towards forested karst cliff habitat, becoming the first bird species in Borneo or even in Indonesia that is specialist to such habitat. Our modeling result also indicates its distribution to be limited on the lowland karst mesa formation to the east of Meratus Range in Kalimantan Selatan Province, with questionable presence in Laut and Sebuku Island. We estimated the total area of possible presence is between 203.84-221.17 km<sup>2</sup>, with a population size between 509-1106 individuals.

We identified primary and secondary forest on karst hill as the main habitat of Black-browed Babbler, especially near cliff-face with adequate undergrowth and lianas present. It was observed

using all levels of vertical niche, but possibly with more tendency to use the lower level for feeding. Three types of feeding methods were observed: leaf gleaning, ground-plucking, and litter probing, with prey items identified as invertebrates. We also recorded several types of vocalization including song, duet, sub-song, alarm call, and possible dawn song that is very distinctive from other *Malacocincla* babblers and may serve as an important identification tool for future research. All observations consist of a single individual or a pair, with no observation of the babbler joining mixed flock, illustrating the extent of social behavior of this species. A virtual change of vocal behavior towards playback throughout the survey may indicate some degree of breeding happening during the survey.

Possible threats to Black-browed Babbler are poaching, logging, forest fire, and mining, with mining possibly becoming the biggest threat to the population as it resulted in total habitat destruction. No Black-browed Babbler was found in the bird market, and our interviews show the generally lack of market interest in this species a year after the publicity of its rediscovery. Only 15% of the predicted presence location is located inside conservation area, which may hold between 75-150 individuals.

## G. Recommendation

With these results, future research is recommended to explore more about the species' tolerance to habitat change and population trend, as well as possible breeding behavior, and to confirm its existence in Pulau Laut and Pulau Sebuk. We also recommend several conservation actions including adjusting existing conservation area boundaries to include adjacent predicted presence locations to increase protection of this species and its habitat. We also strongly recommend this species to be included in the Indonesian List of Protected Species for its high level of endemism as well as its unique characteristic as the only karst-specialist bird in Indonesia.

## H. Acknowledgment

This project was done thanks to the generous fund from Oriental Bird Club and American Bird Conservancy. We also love to appreciate all support from staff of BKSDA Kalimantan Selatan and Dinas Kehutanan Kalimantan Selatan KPH Cantung, Pak Suparjo family in Kotabaru, as well as James Eaton, Yong Ding Li, Alif Andika Bertha Melinda, Maulana Khalid Riefani, Prof. Mochamad Arief Soendjoto and Mapala Sylva ULM Banjarmasin for all their help throughout the expedition.

## Bibliography

- Aguirre-Gutiérrez, Jesús, Luísa G. Carvalheiro, Chiara Polce, E. Emiel van Loon, Niels Raes, Menno Reemer, and Jacobus C. Biesmeijer. 2013. "Fit-for-Purpose: Species Distribution Model Performance Depends on Evaluation Criteria - Dutch Hoverflies as a Case Study." *PLoS ONE* 8(5). doi: 10.1371/journal.pone.0063708.
- Akbar, Panji Gusti, Teguh Willy Nugroho, Muhammad Suranto, Muhammad Rizky Fauzan, Doddy Ferdiansyah, Joko Said Trisiyanto, and Ding Li Yong. 2021. "No Longer an Enigma: Rediscovery of Black-Browed Babbler *Malacocincla Perspicillata* in Kalimantan, Indonesia." *Journal of Asian Ornithology* 37:1–5.
- Akbar, Panji Gusti, Teguh Willy Nugroho, Muhammad Suranto, Muhammad Rizky Fauzan, Doddy Ferdiansyah, Joko Said Trisiyanto, and Ding Li Yong. 2020. "Black-Browed-Babbler." *BirdingASIA* 34:13–14.
- Anderson, Robert P., Daniel Lew, and A. Townsend Peterson. 2003. "Evaluating Predictive Models of Species' Distributions: Criteria for Selecting Optimal Models." *Ecological Modelling* 162(3):211–32. doi: 10.1016/S0304-3800(02)00349-6.
- BirdLife International. 2021. "Species Factsheet: *Malacocincla Perspicillata*." Retrieved March 12, 2021 (<http://datazone.birdlife.org/species/factsheet/black-browed-babbler-malacocincla-perspicillata>).
- Collar, N. J. 2014. "Blue-Wattled Bulbul *Pycnonotus Nieuwenhuisii* and Black-Browed Babbler *Malacocincla Perspicillata*: Two Sundaic Passerines in Search of a Life." *BirdingASIA* 21:37–44.
- Collar, Nigel, and Craig Robson. 2020. "White-Chested Babbler (*Pellorneum Rostratum*), Version 1.0." *Birds of the World*. doi: 10.2173/BOW.WHCBAB1.01.
- Davison, G. W. H. 1997. "Bird Observations on Pulau Laut, South Kalimantan." *Kukila* 9:122–25.
- Eaton, James A., Bas van Balen, Nick W. Brickle, and Frank E. Rheindt. 2016. *Birds of Indonesian Archipelago*. Barcelona: Lynx Edicions.
- Global Forest Watch. 2019. "Indonesia Soil Type." *Global Forest Watch Open Data Portal*. Retrieved March 28, 2022 (<https://data.globalforestwatch.org/documents/indonesia-soil-type/about>).
- Hansen, M. C., P. v. Potapov, R. Moore, M. Hancher, S. A. Turubanova, A. Tyukavina, D. Thau, S. v. Stehman, S. J. Goetz, T. R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C. O. Justice, and R. G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342:850–53.
- Holmes, D. A. 1997. "Kalimantan Bird Report." *Kukila* 9:140–67.
- Jarvis, A., H. I. Reuter, A. Nelson, and E. Guevara. 2008. "Hole-Filled SRTM for the Globe Version 4, Available from the CGIAR-CSI SRTM 90m Database." Retrieved March 28, 2022 (<https://cgiasi.community/data/srtm-90m-digital-elevation-database-v4-1/>).
- Kusmana, C., A. Manshur, O. Rusdian, H. R. Putro, F. Hakim, and M. Ermyanyla. 2017. "Wildlife Species Composition in Various Forest Types on Sebuk Island, South Kalimantan Wildlife Species Composition in Various Forest Types on Sebuk Island, South Kalimantan." *IOP Conference Series: Earth and Environmental Science* 54:012068-undefined. doi: 10.1088/1755-1315/54/1/012068.
- Kwan, Marlis. 2021. "Pegunungan Meratus: Hutan Lindung, Rencana Tambang Dan Urgensi Perlindungannya - Mongabay.Co.Id : Mongabay.Co.Id." *Mongabay Indonesia*, March 6.

- Mansor, Mohammad S., and Shahrul A. Mohd Sah. 2012. "Foraging Patterns Reveal Niche Separation in Tropical Insectivorous Birds." *Acta Ornithologica* 47(1):27–36. doi: 10.3161/000164512X653890.
- Mansor, Mohammad Saiful, Rosli Ramli, and Shahrul Anuar Mohd Sah. 2015. "The Foraging Tactics of Chestnut-Winged Babbler (*Stachyris erythroptera*) and Abbott's Babbler (*Malacocincla abbotti*) in a Lowland Rainforest, Malaysia." *Sains Malaysiana* 44(5):687–92.
- Manzoor, Syed Amir, Geoffrey Griffiths, and Martin Lukac. 2018. "Species Distribution Model Transferability and Model Grain Size – Finer May Not Always Be Better." *Scientific Reports* 2018 8:1 8(1):1–9. doi: 10.1038/s41598-018-25437-1.
- Mees, G. F. 1995. "On *Malacocincla vanderbilti* de Schauensee & Ripley, and *Malacocincla perspicillata* (Bonaparte) (Aves, Timaliidae)." *Proceedings of the Royal Netherlands Academy of Arts and Sciences* 98(1–2):63–68.
- Merow, Cory, Matthew J. Smith, and John A. Silander. 2013. "A Practical Guide to MaxEnt for Modeling Species' Distributions: What It Does, and Why Inputs and Settings Matter." *Ecography* 36(10):1058–69. doi: 10.1111/J.1600-0587.2013.07872.X.
- Morales, Narkis S., Ignacio C. Fernández, and Victoria Baca-González. 2017. "MaxEnt's Parameter Configuration and Small Samples: Are We Paying Attention to Recommendations? A Systematic Review." *PeerJ* 2017(3):e3093. doi: 10.7717/PEERJ.3093/SUPP-5.
- Phillips, Steven J., Robert P. Anderson, Miroslav Dudík, Robert E. Schapire, and Mary E. Blair. 2017. "Opening the Black Box: An Open-Source Release of Maxent." *Ecography* 40(7):887–93. doi: 10.1111/ECOG.03049.
- Phillips, Steven J., and Miroslav Dudík. 2008. "Modeling of Species Distributions with Maxent: New Extensions and a Comprehensive Evaluation." *Ecography* 31(2):161–75. doi: 10.1111/j.0906-7590.2008.5203.x.
- Phillips, Steven J., Miroslav Dudík, Jane Elith, Catherine H. Graham, Anthony Lehmann, John Leathwick, and Simon Ferrier. 2009. "Sample Selection Bias and Presence-Only Distribution Models: Implications for Background and Pseudo-Absence Data." *Ecological Applications* 19(1):181–97. doi: 10.1890/07-2153.1.
- Scheffers, Brett R., Ding Li Yong, J. Berton C. Harris, Xingli Giam, and Navjot S. Sodhi. 2011. "The World's Rediscovered Species: Back from the Brink?" edited by B. Gratwicke. *PLoS ONE* 6(7):e22531. doi: 10.1371/journal.pone.0022531.
- van de Vuurst, Paige, and Luis E. Escobar. 2020. "Perspective: Climate Change and the Relocation of Indonesia's Capital to Borneo." *Frontiers in Earth Science* 8:5. doi: 10.3389/FEART.2020.00005/BIBTEX.

APPENDIX 1 Schedule

September

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Land Travel Yogyakarta-Surabaya			Meeting BKSDA		Land Travel Banjarmasin - Kotabaru				Recce Visit				Land travel Kotabaru - Banjarmasin
		Ferry Crossing Surabaya-Banjarmasin			Birdmarket Survey Banjarmasin									

October

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Birdmarket Survey Banjarmasin, Banjarbaru & Pelaihari		Permit Application			Land Travel Banjarmasin - Kotabaru					Fieldwork Kotabaru			
	Recce Visit Banjarbaru & Pelaihari				Flight Jakarta - Banjarmasin	Land Travel Banjarmasin - Kotabaru					Fieldwork Kotabaru			
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
											Fieldwork Kotabaru			
Fieldwork	Land transport Kotabaru - Banjarmasin	Flight Banjarmasin - Jakarta									Fieldwork Kotabaru			
	Flight Yogyakarta - Banjarmasin	Land Transport Banjarmasin - Kotabaru												

November

---

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Fieldwork Kotabaru			Land Travel Kotabaru - Tanahbumbu	Fieldwork Tanah bumbu (Mantewe, SM Pelaihari, Bajuin)				Land travel Tanah Bumbu - Banjarbaru	Fieldwork Banjarbaru (Tahura Sultan Adam)			Transport Banjarbaru - Loksado	Fieldwork Loksado		
Fieldwork Kotabaru			Land Travel Kotabaru - Tanahbumbu	Fieldwork Tanah bumbu (Mantewe, SM Pelaihari, Bajuin)				Land travel Tanah Bumbu - Banjarbaru	Fieldwork (Tahura Sultan Adam)			Flight Banjarmasin - Yogyakarta			
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Fieldwork Loksado		Meeting BKSDA						Ferry Crossing Sampit-Semarang							
Transport Loksado - Banjarbaru									Land travel Semarang-Yogyakarta						

- Panji Gusti Akbar
- Boas Emmanuel
- Leonardus Adi Saktyari

## APPENDIX 2 Funding Detail

**Funding Details**

Oriental Bird Club	Rp 56,814,342
American Bird Conservancy	Rp 28,714,800
Total	Rp 85,529,142

**Project Spending**

Acitivity	Category	Item	Price	Quantity	Unit	Frequency	Subtotal
Recce visit and birdmarket survey	Transportation	Ferry Banjarmasin-Surabaya (Panji)	Rp 809,000	1	Person	1	Rp 809,000
		Fuel (Yogyakarta-Banjarmasin-Kelumpang Hilir)	Rp 9,800	7	Litre	5	Rp 343,000
		Fuel (Field visit)	Rp 9,800	5	Litre	6	Rp 294,000
	Accomodation	Hotel Transit (Banjarmasin)	Rp 200,000	1	room	3	Rp 600,000
		Homestay (Field site)	Rp 100,000	1	Person	8	Rp 800,000
		Food (3/day)	Rp 60,000	1	Person	14	Rp 840,000
	Survey Expenses	Local guide	Rp 200,000	1	Person	7	Rp 1,400,000
	Health and Safety	Swab PCR COVID Test*	Rp 800,000	1	Person	1	Rp 800,000
		First Aid Kit	Rp 100,000	1	Unit	1	Rp 100,000
		Hand Sanitizer	Rp 25,000	2	Unit	1	Rp 50,000
		Face mask N-95	Rp 20,000	3	Packs	1	Rp 60,000
	Research permit application and Birdmarket Survey	Transportation	Fuel (Kelumpang Hilir-Banjarmasin)	Rp 9,800	7	Litre	1



		Fuel (Banjarmasin)	Rp 9,800	1	Litre	5	Rp 49,000	
	Accomodation	Hotel Banjarmasin	Rp 150,000	1	room	6	Rp 900,000	
		Food	Rp 60,000	1	Person	6	Rp 360,000	
	Bearucracy	Printing Proposal	Rp 20,000	3	Packs	1	Rp 60,000	
		Duty stamp (for permit)	Rp 10,000	3	stamp	1	Rp 30,000	
Fieldwork Kotabaru	Transportation	2-way flight Jakarta-Banjarmasin (Boas)	Rp 1,346,239	1	Person	1	Rp 1,346,239	
		2-way flight Yogyakarta-Banjarmasin (Saktyari)	Rp 1,203,256	1	Person	1	Rp 1,203,256	
		2-way land transport Banjarmasin-Kelumpang Hilir (Saktyari & Boas)	Rp 500,000	2	Person	1	Rp 1,000,000	
		Fuel (Banjarmasin-Kelumpang Hilir)	Rp 9,800	7	Litre	2	Rp 137,200	
		Fuel (During fieldwork)	Rp 9,800	5	Litre	27	Rp 1,323,000	
		Motorcycle Rental (Fieldwork)	Rp 100,000	2	Unit	27	Rp 5,400,000	
	Accomodation	Food (3/day)	Rp 60,000	2	Person	27	Rp 3,240,000	
		Homestay (Field site)	Rp 100,000	2	Person	27	Rp 5,400,000	
		Hotel Transit (Banjarmasin)	Rp 200,000	2	Person	2	Rp 800,000	
	Survey Expenses	Local guide	Rp 200,000	2	Person	27	Rp 10,800,000	
	Health and Safety	Swab PCR COVID Test*	Rp 800,000	2	Person	2	Rp 3,200,000	
		Swan Antigen COVID Test**	Rp 150,000	2	Person	4	Rp 1,200,000	
		Hand Sanitizer	Rp 25,000	2	Unit	1	Rp 50,000	
		Face mask N-95	Rp 20,000	4	Packs	1	Rp 80,000	
	Extended Fieldwork (including birdmarket survey)	Transportation	Fuel (Between sites)	Rp 9,800	7	Litre	5	Rp 343,000

		Fuel (Fieldwork)	Rp 9,800	5	Litre	10	Rp 490,000
		Motorcycle Rental (Fieldwork)	Rp 100,000	1	Unit	15	Rp 1,500,000
		Ferry Sampit-Semarang (Panji)	Rp 785,000	2	Person	1	Rp 1,570,000
	Accommodation	Food (3/day)	Rp 60,000	2	Person	15	Rp 1,800,000
		Homestay	Rp 100,000	2	Person	15	Rp 3,000,000
	Survey Expenses	Local guide	Rp 200,000	2	Person	15	Rp 6,000,000
	Health and Safety	Swab Antigen COVID Test**	Rp 150,000	2	Person	2	Rp 600,000
		Swab PCR COVID Test*	Rp 800,000	1	Person	2	Rp 1,600,000
Equipment and Others	Equipment Rental	GPS Rental	Rp 70,000	2	Unit	72	Rp 10,080,000
		Handheld Recorder Rental	Rp 50,000	2	Unit	72	Rp 7,200,000
		Rangefinder rental	Rp 50,000	2	Unit	72	Rp 7,200,000
	Communication	Internet	Rp 150,000	3	Unit	3	Rp 1,350,000
Total							Rp 85,476,295

## APPENDIX 3 Birds of Eastern Meratus Karst Formation

Resident Status: R = Resident, M = Migratory, I = Introduced

No	Family	Common Name	Scientific name	IUCN Status	Resident Status
1	Acanthizidae	Golden-bellied Gerygone	<i>Gerygone sulphurea</i>	LC	R
2	Accipitridae	Oriental Honey-buzzard	<i>Pernis ptilorhynchus</i>	LC	M
3	Accipitridae	Black Eagle	<i>Ictinaetus malaiensis</i>	LC	R
4	Accipitridae	Brahminy Kite	<i>Haliastur indus</i>	LC	R
5	Accipitridae	Changeable Hawk-Eagle	<i>Nisaetus cirrhatus</i>	LC	R
6	Accipitridae	Crested Serpent-eagle	<i>Spilornis cheela</i>	LC	R
7	Accipitridae	Wallace's Hawk-Eagle	<i>Nisaetus nanus</i>	VU	R
8	Aegithinidae	Common Iora	<i>Aegithina tiphia</i>	LC	R
9	Aegithinidae	Green Iora	<i>Aegithina viridissima</i>	NT	R
10	Alcedinidae	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	LC	R
11	Alcedinidae	Black-faced Kingfisher	<i>Lacedo melanops</i>	LC	R
12	Alcedinidae	Blue-eared Kingfisher	<i>Alcedo meninting</i>	LC	R
13	Alcedinidae	Oriental Dwarf-kingfisher	<i>Ceyx erithaca</i>	LC	R
14	Alcedinidae	Stork-billed Kingfisher	<i>Pelargopsis capensis</i>	LC	R
15	Alcedinidae	Ruddy Kingfisher (major)	<i>Halcyon coromanda major</i>	LC	M
16	Apodidae	Glossy Swiftlet	<i>Collocalia esculenta</i>	LC	R
17	Apodidae	Pacific Swift	<i>Apus pacificus</i>	LC	R
18	Ardeidae	Cattle Egret	<i>Bubulcus ibis</i>	LC	R
19	Ardeidae	Green-backed Heron	<i>Butorides striata</i>	LC	R
20	Ardeidae	Javan Pond-heron	<i>Ardeola speciosa</i>	LC	R
21	Ardeidae	Little Egret	<i>Egretta garzetta</i>	LC	R
22	Artamidae	White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	LC	R
23	Bucerotidae	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	LC	R
24	Bucerotidae	Bushy-crested Hornbill	<i>Anorrhinus galeritus</i>	NT	R
25	Bucerotidae	Wreathed Hornbill	<i>Rhyticeros undulatus</i>	VU	R
26	Calyptomenidae	Green Broadbill	<i>Calyptomena viridis</i>	NT	R

27	Chloropseidae	Greater Green Leafbird	<i>Chloropsis sonnerati</i>	EN	R
28	Chloropseidae	Lesser Green Leafbird	<i>Chloropsis cyanopogon</i>	NT	R
29	Ciconiidae	Lesser Adjutant	<i>Leptoptilos javanicus</i>	VU	R
30	Cisticolidae	Ashy Tailorbird	<i>Orthotomus ruficeps</i>	LC	R
31	Cisticolidae	Rufous-tailed Tailorbird	<i>Orthotomus sericeus</i>	LC	R
32	Cisticolidae	Yellow-bellied Prinia	<i>Prinia flaviventris</i>	LC	R
33	Columbidae	Zebra Dove	<i>Geopelia striata</i>	LC	I
34	Columbidae	Black-naped Fruit-dove	<i>Ptilinopus melanospilus</i>	LC	R
35	Columbidae	Eastern Spotted Dove	<i>Spilopelia chinensis</i>	LC	R
36	Columbidae	Green Imperial-pigeon	<i>Ducula aenea</i>	LC	R
37	Columbidae	Grey-capped Emerald Dove	<i>Chalcophaps indica</i>	LC	R
38	Columbidae	Little Green-pigeon	<i>Treron olax</i>	LC	R
39	Coraciidae	Oriental Dollarbird	<i>Eurystomus orientalis</i>	LC	R
40	Corvidae	Slender-billed Crow	<i>Corvus enca</i>	LC	R
41	Cuculidae	Brush Cuckoo	<i>Cacomantis variolosus</i>	LC	R
42	Cuculidae	Chestnut-breasted Malkoha	<i>Phaenicophaeus curvirostris</i>	LC	R
43	Cuculidae	Greater Coucal	<i>Centropus sinensis</i>	LC	R
44	Cuculidae	Lesser Coucal	<i>Centropus bengalensis</i>	LC	R
45	Cuculidae	Little Bronze-cuckoo	<i>Chalcites minutillus</i>	LC	R
46	Cuculidae	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	LC	R
47	Cuculidae	Raffles's Malkoha	<i>Rhinortha chlorophaea</i>	LC	R
48	Cuculidae	Square-tailed Drongo-Cuckoo	<i>Surniculus lugubris</i>	LC	R
49	Dicaeidae	Black-sided Flowerpecker	<i>Dicaeum monticulum</i>	LC	R
50	Dicaeidae	Orange-bellied Flowerpecker	<i>Dicaeum trigonostigma</i>	LC	R
51	Dicaeidae	Plain Flowerpecker	<i>Dicaeum minullum</i>	LC	R
52	Dicaeidae	Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i>	LC	R
53	Dicaeidae	Scarlet-headed Flowerpecker	<i>Dicaeum trochileum</i>	LC	R
54	Dicaeidae	Yellow-breasted Flowerpecker	<i>Prionochilus maculatus</i>	LC	R
55	Dicaeidae	Yellow-vented Flowerpecker	<i>Pachyglossa chrysorrhea</i>	LC	R
56	Dicruridae	Greater Racquet-tailed Drongo	<i>Dicrurus paradiseus</i>	LC	R
57	Estrildidae	Java Sparrow	<i>Lonchura oryzivora</i>	EN	I

58	Estrildidae	Chestnut Munia	<i>Lonchura atricapilla</i>	LC	R
59	Estrildidae	Dusky Munia	<i>Lonchura fuscans</i>	LC	R
60	Eurylaimidae	Black-and-red Broadbill	<i>Cymbirhynchus macrorhynchos</i>	LC	R
61	Eurylaimidae	Black-and-yellow Broadbill	<i>Eurylaimus ochromalus</i>	NT	R
62	Falconidae	Black-thighed Falconet	<i>Microhierax fringillarius</i>	LC	R
63	Hemiprocnidae	Grey-rumped Treeswift	<i>Hemiprocne longipennis</i>	LC	R
64	Hemiprocnidae	Whiskered Treeswift	<i>Hemiprocne comata</i>	LC	R
65	Hirundinidae	Barn Swallow	<i>Hirundo rustica</i>	LC	M
66	Hirundinidae	House Swallow	<i>Hirundo javanica</i>	LC	R
67	Irenidae	Asian Fairy-bluebird	<i>Irena puella</i>	LC	R
68	Laniidae	Long-tailed Shrike	<i>Lanius schach</i>	LC	R
69	Leiotrichidae	Brown Fulvetta	<i>Alcippe brunneicauda</i>	NT	R
70	Megalaimidae	Black-eared Barbet	<i>Psilopogon duvaucelii</i>	LC	R
71	Megalaimidae	Bornean Brown Barbet	<i>Caloramphus fuliginosus</i>	LC	R
72	Megalaimidae	Gold-whiskered Barbet	<i>Psilopogon chrysopogon</i>	LC	R
73	Megalaimidae	Red-crowned Barbet	<i>Psilopogon rafflesii</i>	NT	R
74	Megalaimidae	Red-throated Barbet	<i>Psilopogon mystacophanos</i>	NT	R
75	Megalaimidae	Yellow-crowned Barbet	<i>Psilopogon henricii</i>	NT	R
76	Meropidae	Blue-tailed Bee-eater	<i>Merops philippinus</i>	LC	M
77	Meropidae	Blue-throated Bee-eater	<i>Merops viridis</i>	LC	R
78	Meropidae	Red-bearded Bee-eater	<i>Nyctyornis amictus</i>	LC	R
79	Monarchidae	Black-naped Monarch	<i>Hypothymis azurea</i>	LC	R
80	Muscicapidae	Bornean Whistling-thrush	<i>Myophonus borneensis</i>	LC	R
81	Muscicapidae	Mangrove Blue-flycatcher	<i>Cyornis rufigastra</i>	LC	R
82	Nectariniidae	Brown-throated Sunbird	<i>Anthreptes malacensis</i>	LC	R
83	Nectariniidae	Crimson Sunbird	<i>Aethopyga siparaja</i>	LC	R
84	Nectariniidae	Little Spiderhunter	<i>Arachnothera longirostra</i>	LC	R
85	Nectariniidae	Maroon-bellied Sunbird	<i>Leptocoma brasiliana</i>	LC	R
86	Nectariniidae	Olive-backed Sunbird	<i>Cinnyris jugularis</i>	LC	R
87	Nectariniidae	Plain Sunbird	<i>Anthreptes simplex</i>	LC	R

			Kurochkinogramma		
88	Nectariniidae	Purple-naped Sunbird	hypogrammica	LC	R
89	Nectariniidae	Ruby-cheeked Sunbird	Chalcopteryx singalensis	LC	R
90	Nectariniidae	Red-throated Sunbird	Anthreptes rhodolaemus	NT	R
91	Oriolidae	Dark-throated Oriole	Oriolus xanthonotus	NT	R
92	Passeridae	Eurasian Tree Sparrow	Passer montanus	LC	R
93	Pellorneidae	Black-browed Babbler	Malacocincla perspicillata	DD	R
94	Pellorneidae	Horsfield's Babbler	Malacocincla sepiaria	LC	R
95	Pellorneidae	Scaly-crowned Babbler	Malacopteron cinereum	LC	R
96	Pellorneidae	Rufous-crowned Babbler	Malacopteron magnum	NT	R
97	Pellorneidae	Sooty-capped Babbler	Malacopteron affine	NT	R
98	Pellorneidae	White-chested Babbler	Trichastoma rostratum	NT	R
99	Phasianidae	Asian Blue Quail	Synoicus chinensis	LC	R
100	Phasianidae	Great Argus	Argusianus argus	VU	R
101	Phylloscopidae	Arctic Warbler	Phylloscopus borealis	LC	M
102	Picidae	Banded Woodpecker	Chrysophlegma miniaceum	LC	R
103	Picidae	Rufous Piculet	Sasia abnormis	LC	R
104	Picidae	Sunda Pygmy Woodpecker	Picoides moluccensis	LC	R
105	Picidae	Buff-necked Woodpecker	Meiglyptes tukki	NT	R
106	Pittidae	Western Hooded Pitta	Pitta sordida	LC	R
107	Platylophidae	Crested Jay	Platylophus galericulatus	NT	R
108	Ploceidae	Streaked Weaver	Ploceus manyar	LC	I
109	Psittacidae	Blue-crowned Hanging-parrot	Loriculus galgulus	LC	R
110	Pycnonotidae	Sooty-headed Bulbul	Pycnonotus aurigaster	LC	I
111	Pycnonotidae	Black-headed Bulbul	Brachypodius atriceps	LC	R
112	Pycnonotidae	Chestnut-vented Bulbul	Alophoixus ruficrissus	LC	R
113	Pycnonotidae	Cream-vented Bulbul	Pycnonotus simplex	LC	R
114	Pycnonotidae	Olive-winged Bulbul	Pycnonotus plumosus	LC	R
115	Pycnonotidae	Red-eyed Bulbul	Pycnonotus brunneus	LC	R
116	Pycnonotidae	Spectacled Bulbul	Ixidia erythropthalmos	LC	R
117	Pycnonotidae	Yellow-vented Bulbul	Pycnonotus goiavier	LC	R

118	Pycnonotidae	Buff-vented Bulbul	<i>Iole charlottae</i>	NT	R
119	Pycnonotidae	Puff-backed Bulbul	<i>Euptilotus eutilotus</i>	NT	R
120	Rallidae	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	LC	R
121	Rhipiduridae	Sunda Pied Fantail	<i>Rhipidura javanica</i>	LC	R
122	Strigidae	Buffy Fish-Owl	<i>Ketupa ketupu</i>	LC	R
123	Strigidae	Sunda Scops-owl	<i>Otus lempiji</i>	LC	R
124	Sturnidae	Asian Glossy Starling	<i>Aplonis panayensis</i>	LC	R
125	Sturnidae	Javan Myna	<i>Acridotheres javanicus</i>	VU	I
126	Timaliidae	Bold-striped Tit-Babbler	<i>Mixornis bornensis</i>	LC	R
127	Timaliidae	Chestnut-backed Scimitar-Babbler	<i>Pomatorhinus montanus</i>	LC	R
128	Timaliidae	Grey-hooded Babbler	<i>Cyanoderma bicolor</i>	LC	R
129	Timaliidae	Fluffy-backed Tit-babbler	<i>Macronus ptilosus</i>	NT	R
130	Trogonidae	Scarlet-rumped Trogon	<i>Harpactes duvaucelii</i>	NT	R
131	Tytonidae	Oriental Bay-owl	<i>Phodilus badius</i>	LC	R
132	Vangidae	Black-winged Flycatcher-shrike	<i>Hemipus hirundinaceus</i>	LC	R
133	Vireonidae	White-bellied Erpornis	<i>Erpornis zantholeuca</i>	LC	R
134	Zosteropidae	Chestnut-crested Yuhina	<i>Yuhina everetti</i>	LC	R

## APPENDIX 4 Bird Trade around Meratus Range

Legend: <sup>1</sup>Protected by Indonesian law, <sup>2</sup>Endemic to Borneo, <sup>3</sup>Migratory, <sup>4</sup>Introduced, <sup>5</sup>Non-native.

Family	Scientific Name	Status	Angsana	Banjarbaru	Banjarmasin	Batulicin	Kandangan	Karangindah	Serongga	Grand Total
Acrocephalidae	Australasian Reed-Warbler	LC			1					1
Aegithinidae	Common Iora	LC			10				2	12
Anatidae	Wandering Whistling-Duck	LC			9					9
Artamidae	White-Breasted Woodswallow	LC			2					2
Cacatuidae	Cockatiel <sup>5</sup>	LC			3	7				10
Campephagidae	Small Minivet	LC			39					39
Campephagidae	Scarlet Minivet	LC		2	7					9
Campephagidae	Fiery Minivet	NT						1		1
Chloropseidae	Greater Green Leafbird <sup>1</sup>	EN	3	9	5	2	5			24
Chloropseidae	Lesser Green Leafbird <sup>1</sup>	NT	1	2	6	1				10
Chloropseidae	Blue-Winged Leafbird <sup>1</sup>	LC		1	5					6
Chloropseidae	Bornean Leafbird <sup>1,2</sup>	LC							1	1
Cisticolidae	Ashy Tailorbird	LC		9	15		1			25
Cisticolidae	Bar-Winged Prinia <sup>4</sup>	NT		1	6					7
Cisticolidae	Plain Prinia <sup>5</sup>	LC		3	3					6
Cisticolidae	Yellow-Bellied Prinia	LC			1					1
Cisticolidae	Olive-Backed Tailorbird <sup>5</sup>	LC			1					1
Columbidae	Zebra Dove	LC		65	61	91	1	17	1	236
Columbidae	Eastern Spotted Dove	LC		28	32	1		26		87
Columbidae	Eurasian Collared-Dove <sup>5</sup>	LC			5	3		4		12
Columbidae	Pink-Necked Green-Pigeon	LC			7					7
Columbidae	Barred Dove <sup>5</sup>	LC		2				1		3
Dicaeidae	Scarlet-Headed Flowerpecker	LC			21					21
Dicaeidae	Orange-Bellied Flowerpecker	LC		5	4					9
Dicaeidae	Yellow-Vented Flowerpecker	LC			1					1
Dicaeidae	Yellow-Breasted Flowerpecker	LC		1						1



Dicruridae	Greater Racquet-Tailed Drongo	Dicrurus paradiseus	LC			3	1				4
Estrildidae	Java Sparrow <sup>1 4</sup>	Lonchura oryzivora	EN	9		3	14		10		36
Estrildidae	Timor Zebra Finch <sup>5</sup> Black-And-Yellow	Taeniopygia guttata	LC			3					3
Eurylaimidae	Broadbill	Eurylaimus ochromalus	NT	2							2
Fringillidae	Canary <sup>5</sup>	Serinus canaria domestica	LC	34		23	17	4	1		79
Irenidae	Asian Fairy-Bluebird	Irena puella	LC			1					1
Laniidae	Long-Tailed Shrike	Lanius schach	LC	11		36		1		1	49
Leiotrichidae	Chestnut-Hooded Laughingthrush <sup>2</sup>	Garrulax treacheri	LC	3				2			5
Leiotrichidae	Sumatran Laughingthrush <sup>1 5</sup>	Garrulax bicolor	EN			1		1			2
Leiotrichidae	Long-Tailed Sibia <sup>5</sup>	Heterophasia picaoides	LC			1					1
Megalaimidae	Red-Throated Barbet <sup>1</sup>	Psilopogon mystacophanos	NT			1					1
Monarchidae	Oriental Paradise-Flycatcher	Terpsiphone affinis	LC			2					2
Muscicapidae	Oriental Magpie-Robin	Copsychus saularis	LC	3	5	22	1	1	3	1	36
Muscicapidae	White-Rumped Shama	Kittacincla malabarica	LC	1	8	14	1	6	1		31
Muscicapidae	Malay Blue-Flycatcher	Cyornis turcosus	NT		1	10					11
Muscicapidae	Mangrove Blue-Flycatcher	Cyornis rufigastra	LC		7	1					8
Muscicapidae	Siberian Blue Robin <sup>3</sup>	Larvivora cyane	LC					2			2
Muscicapidae	Rufous-Chested Flycatcher	Ficedula dumetoria	LC					2			2
Muscicapidae	Zapppy's Flycatcher <sup>3</sup>	Cyanoptila cumatilis	NT					2			2
Muscicapidae	Little Pied Flycatcher	Ficedula westermanni	LC					1			1
Muscicapidae	Eyebrowed Jungle-Flycatcher <sup>2</sup>	Vauriella gularis	LC					1			1
Muscicapidae	Pied Bushchat <sup>5</sup>	Saxicola caprata	LC				1				1
Muscicapidae	Meratus Blue-flycatcher <sup>2</sup>	Cyornis sp nova	NA					1			1
Nectariniidae	Maroon-Bellied Sunbird	Leptocoma brasiliana	LC	1		51		96			148
Nectariniidae	Brown-Throated Sunbird	Anthreptes malacensis	LC			15		2		5	22
Nectariniidae	Olive-Backed Sunbird	Cinnyris jugularis	LC	2		11				1	14
Nectariniidae	Crimson Sunbird <sup>1</sup>	Aethopyga siparaja	LC			12					12
Nectariniidae	Copper-Throated Sunbird	Leptocoma calcostetha	LC			12					12
Nectariniidae	Ruby-Cheeked Sunbird	Chalcoparia singalensis	LC	1		5		1			7
Nectariniidae	Little Spiderhunter	Arachnothera longirostra	LC			2					2

Oriolidae	Black-Naped Oriole <sup>5</sup>	Oriolus chinensis celebensis	LC	1		1			1	3	
Oriolidae	Dark-Throated Oriole	Oriolus xanthonotus	NT			2				2	
Pachycephalidae	Mangrove Whistler	Pachycephala cinerea	LC			1				1	
Paridae	Great Tit	Parus major	LC			1				1	
Passeridae	Eurasian Tree Sparrow	Passer montanus	LC					3		3	
Pellorneidae	Abbott's Babbler	Malacocincla abbotti	LC			3				3	
Pellorneidae	Scaly-Crowned Babbler	Malacopteron cinereum	LC						1	1	
Pellorneidae	Moustached Babbler	Malacopteron magnirostre	LC					1		1	
Phasianidae	Asian Blue Quail Sunda Pygmy	Synoicus chinensis	LC			99			1	100	
Picidae	Woodpecker	Picoides moluccensis	LC	2		19			2	23	
Picidae	Common Flameback	Dinopium javanense	LC			1				1	
Pittidae	Western Hooded Pitta <sup>1</sup>	Pitta sordida	LC			1				1	
Ploceidae	Streaked Weaver <sup>4</sup>	Ploceus manyar	LC			85		13		98	
Psittacidae	Blue-Crowned Hanging- Parrot <sup>1</sup>	Loriculus galgulus	LC		1	1		11	9	22	
Psittaculidae	Lovebird <sup>5</sup>	Agapornis sp	NA	4	99	59	39	10	27	7	245
Psittaculidae	Budgerigar <sup>5</sup>	Melopsittacus undulatus	LC		36	32	25		9	102	
Pycnonotidae	Black-Headed Bulbul	Brachypodius atriceps	LC	1	28	56		5		90	
Pycnonotidae	Grey-Cheeked Bulbul	Alophoixus tephrogenys	VU		32	2		1	2	37	
Pycnonotidae	Sooty-Headed Bulbul <sup>4</sup>	Pycnonotus aurigaster	LC		12	19				31	
Pycnonotidae	Yellow-Vented Bulbul	Pycnonotus goiavier	LC	4	4	15				23	
Pycnonotidae	Chestnut-Vented Bulbul <sup>2</sup>	Alophoixus ruficrissus	LC	1	3	2		14		20	
Pycnonotidae	Olive-Winged Bulbul	Pycnonotus plumosus	LC		1	13				14	
Pycnonotidae	Brown-Cheeked Bulbul <sup>5</sup>	Alophoixus bres	EN		4	2				6	
Pycnonotidae	Cream-Vented Bulbul	Pycnonotus simplex	LC			4				4	
Pycnonotidae	Scaly-Breasted Bulbul	Ixidia squamata	NT			1			1	2	
Pycnonotidae	Hook-Billed Bulbul <sup>1</sup>	Setornis criniger	VU		1			1		2	
Pycnonotidae	Red-Eyed Bulbul	Pycnonotus brunneus	LC		1					1	
Pycnonotidae	Streaked Bulbul	Ixos malaccensis	NT			1				1	
Pycnonotidae	Black-And-White Bulbul White-Breasted	Microtarsus melanoleucos	NT			1				1	
Rallidae	Waterhen	Amaurornis phoenicurus	LC			3				3	
Rhipiduridae	Sunda Pied Fantail	Rhipidura javanica	LC		2	8				10	
Scolopacidae	Common Sandpiper <sup>3</sup>	Actitis hypoleucos	LC			1				1	

Scotocercidae	Yellow-Bellied Warbler	Abroscopus superciliaris	LC					2	2
Sittidae	Velvet-Fronted Nuthatch	Sitta frontalis	LC		1			2	3
Strigidae	Sunda Scops-Owl	Otus lempiji	LC	1	1		1		3
Sturnidae	Javan Myna <sup>4</sup>	Acridotheres javanicus	VU	33	57	17		10	117
Sturnidae	Javan Pied Starling <sup>5</sup>	Gracupica jalla	CR	7	7				14
Sturnidae	Common Hill Myna <sup>1</sup>	Gracula religiosa	LC			2	3	1	6
Sturnidae	Black-Winged Myna <sup>1 5</sup>	Acridotheres melanopterus	CR		2				2
Sturnidae	Bali Myna <sup>1 5</sup>	Leucopsar rothschildi	CR		2				2
Timaliidae	Bold-Striped Tit-Babbler	Mixornis bornensis	LC		14				14
Timaliidae	Chestnut-Backed Scimitar-Babbler	Pomatorhinus montanus	LC				1		1
Timaliidae	Pin-Striped Tit-Babbler <sup>5</sup>	Mixornis gularis	LC				1		1
Turdidae	Chestnut-Capped Thrush	Geokichla interpres	EN	2	1	3		1	7
Turdidae	Red-Backed Thrush <sup>5</sup>	Geokichla erythronota	NT				1		1
Tytonidae	Oriental Bay-Owl	Phodilus badius	LC			1			1
Vangidae	Bar-Winged Flycatcher-Shrike	Hemipus picatus	LC	1					1
Vireonidae	White-Bellied Erpornis	Erpornis zantholeuca	LC		4				4
Zosteropidae	Javan White-Eye	Zosterops flavus	EN	6	82	15		1	104
Zosteropidae	Hume's White-Eye	Zosterops auriventer	LC	17	12		16	17	62
Zosteropidae	Lemon-Bellied White-Eye	Zosterops chloris	LC	11					11
Zosteropidae	Meratus White-Eye <sup>2</sup>	Zosterops sp nova	NA				4		4
Zosteropidae	Pygmy White-Eye	Heleia squamifrons	LC	2	1				3
Zosteropidae	Thick-Billed White-Eye <sup>5</sup>	Heleia crassirostris	LC	2					2

APPENDIX 5 Documentation



*Figure 11 Typical Black-browed Babbler's Habitat*



*Figure 10 Black-browed Babbler*



Figure 12 Opportunistic searching



Figure 13 Bird Market Survey