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# Categorizing the songbird market through big data and machine learning in the context of Indonesia's online market

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A B S T R A C T

The songbird trade has been identified as a major threat to wild populations, and the bird market has now expanded to online platforms. The study explored the use of machine learning models as a monitoring framework; developed models for taxa identification; applied the best model to understand the current market situation (taxa composition, asking price, and location); and conducted a survey to understand the profile of sellers. The authors found that the machine learning models produced a high level of accuracy in distinguishing relevant ads and identified the songbirds' taxa. The Support Vector Machine (SVM) was selected as the best model and was used to predict the ad population. The model identified 284,118 songbirds from 247 taxa that were listed online from April 2020 to September 2021. The authors also found that 6.2% of ads listed threatened taxa based on the IUCN Red List. The survey results suggested that songbird sellers are mostly hobbyists or breeders looking for extra income from selling birds. As current studies of the songbird market are mostly conducted offline in the bird markets, transactions by non-bird traders or among hobbyists in the online market are remain underreported. Therefore, monitoring needs to be extended to the online market and to our knowledge, currently there is no applied system or platform is identified for monitoring online songbird market. The result from this study can help fill this gap. Information from the monitoring of the songbird online market in this study may assist stakeholders in formulating corrective action based on the current market situation.

## 1. Introduction

The wildlife trade is a multibillion-dollar business (Scheffers et al., 2019; Verissimo and Wan, 2019) and is known to be a major threat to species extinction, besides habitat loss (Collar et al., 1996; Collar and Juniper, 1991; Harris et al., 2017; Jepson et al., 2011; Jepson and Ladle, 2005; Nijman et al., 2018; Wright et al., 2001). It also raises concerns about the risk of disease and the introduction of invasive species (Smith et al., 2009). Among terrestrial vertebrates, birds are a major component of the wildlife trade (Scheffers et al., 2019). The keeping of songbirds has been part of local culture and tradition in many regions of Southeast Asia, and the trade involves millions of individual birds from hundreds of species annually (Lee et al., 2016). Indonesia is a major regional market with high demand for songbirds as pets and for songbird competitions, involving hundreds of bird species, including globally threatened ones (Chng et al., 2015; Chng and Eaton, 2016; Harris et al., 2017; Lee et al., 2016; Nijman, 2010). It was revealed in several studies

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that the demand of caged birds in Indonesia, especially songbird species, linked to decrease of threatening species in nature. This phenomenomen called as Asian Songbird Crisis that led into various conservation initiatives for species in concern (Sykes, 2017). Most of the songbird trade is in the domestic market but also involves other countries in the region (Chng et al., 2015; Leupen et al., 2018). Indonesia is the largest importer and exporter of wild bird in Asia (Harris et al., 2017) and official export data shows that bird export value is increasing significantly in 2021 from 2016 that indicates that the trade volume to international market is growing (Ministry of Environment and Forestry, 2022). CITES database (https://trade.cites.org/) recorded that during 2012–2021, around 99% exported bird from Indonesia was in living form, although major species are not songbird species. On the other hand, the study on the seizure reports in Indonesia indicates that illegal trafficking of bird species to or from Indonesia is still ongoing, including songbird species (Indraswari et al., 2020).

The songbird trade is also evolving from physical marketplaces to online platforms (Harrison et al., 2016; Lee et al., 2016; Leupen et al., 2020; Shepherd et al., 2020). A recent household survey indicated that 12–21% of bird keepers use online platforms to buy songbirds (Marshall et al., 2020a). The songbird market's extension to online platforms, in which regulation for online trade is unclear (Iqbal, 2015), can potentially threaten any number of Indonesian species in the future due to uncontrolled trade (Bušina et al., 2018). Current studies and songbird market monitoring are conducted mostly in physical bird markets and in large cities (Chng et al., 2015, 2018; Chng and Eaton, 2016; Nijman et al., 2021; Rentschlar et al., 2018; Yohanna et al., 2021). As a result, the songbird trade outside physical bird markets is not captured in the observational data.

The expansion of the songbird market to online platforms also presents an opportunity to conduct big data analysis. This enables machine learning algorithms to uncover more fine-grained patterns and to make more timely and accurate predictions (Zhou et al., 2017). Raw information from advertisements cannot be directly linked to the songbird taxa, is unstructured and does not use standard language, for example most of bird names used in the advertisement are using slang or local names. Therefore, a further process in classifying songbird taxa was necessary. With the large volume of information that needs to be classified, machine learning tools can provide an automated classification with a high level of accuracy, as shown in other research, and are suitable for long-term monitoring to explore the supply chain and the actors involved (Di Minin et al., 2018, 2019; Fink et al., 2021; Jeawak et al., 2018; Stringham et al., 2021).

In this study, the authors explore an automated approach to classifying songbird species from online ads through the use of machine learning algorithms, applying the best selected model to understand the songbird online market and the characteristics of the bird sellers. Information on the composition and volume of species, and where they are traded, is highly valuable for conservation research and practice (Scheffers et al., 2019). An efficient and reliable monitoring framework is an important part of conservation strategies (Lee et al., 2016), and the model developed in this study can be a useful framework for monitoring the market, while helping reduce the risk of species extinction from the wildlife trade. Information on sellers' profiles can be used to target the appropriate audience when promoting sustainable wildlife trade (Marshall et al., 2020a; Verissimo et al., 2012). Thus, results from this study are relevant and could contribute to current conservation strategies.

## 2. Methods

### 2.1. Data collection and preparation

We were collecting listings of songbird advertisement from an online marketplace in Indonesia that publicly available without further authentication or registration. The authors developed a Python-based web-scraping tool to collect all listing under bird category from the online marketplace. Information from the ads included titles that indicated the species, along with the asking prices and seller locations. For the model development, 35% of monthly ads from April 2020 to June 2021 were selected randomly. Preprocessing is an important component of a typical text-classification framework and may significantly improve the classification accuracy (Uysal and Gunal, 2014). To prepare clean text for the models, the authors converted text into lowercase and replaced the signs "+ " and "&" with the word "and," and replaced all punctuation with a space. After looking at the dataset and finding a lot of words that were accidentally connected with punctuation, the authors also replaced punctuation with a space instead of removing it. This approach extracts words and removes all punctuation from the models at the same time. The stop-word list for taxa classification models was also applied. As the words in the ads were written in *Bahasa* (Indonesian language) and were not standard – with a lot of abbreviations, misspellings and local terms relating to birds – the authors developed a stop-word list by generating a list of words from the ads and manually selecting those that were not related to the taxa names.

### 2.2. Taxa classification model

For this study, songbirds are defined as passerine bird species and other birds that commonly participate in singing contests. These include Lovebirds (*Agapornis spp*.), various doves, and non-passerines that are known as master birds for competitive taxa, such as Kingfishers and Woodpeckers. However, in developing the machine learning model, the authors labelled and trained all listed birds to extend the model's ability, then filtered the ads using the songbird definition for further analysis.

Songbird taxa identification from the advertisements is comprised of two steps. In the first step, a model is developed to remove from the listing any nonrelevant ads, such as those relating to cages, feed and bird's accessories, as well as want-to-buy ads. The authors manually labelled the records into not relevant, wanted and relevant ads, using original text written in the title of the ads that have been pre-processed for this classification. The second step is taxa classification, which involves using only relevant ads from the first step and applying the stop-word list. In taxa identification, the record was labelled using the name lists from the Handbook of the

Birds of the World (HBW and BirdLife International, 2021) and the List of Indonesian Birds (Sukmantoro et al., 2007). The authors also labelled ad records that did not mention any taxa name as "Unknown" and removed from the training dataset those that had more than one taxon. As most taxa were listed using local names or trade names, the authors consulted local well-known songbird communities' websites, and compare the images from the listing with images from birdsoftheworld.org to identify the taxa scientific name. Taxonomy follows (del Hoyo and Collar, 2014, 2016).

For both steps, the authors used supervised machine-learning algorithms of Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), Gated Recurrent Units (GRU), Convolutional Neural Networks (CNN), the Naive Bayes classifier, the Random Forest technique, Support Vector Machines (SVM), and Linear Regression. All model development was performed in Python using the PyTorch (Paszke et al., 2019) and Scikit-learn library (Pedregosa et al., 2011).

### 2.3. Model performance assessment

Labelled datasets were split into three with the following proportions: 80% for the training dataset, 10% validation dataset and 10% for the test dataset. The training dataset was used to train and make the model learn the patterns repeatedly, and continue to learn the features of the data. Validation processes evaluate the model performance during training and provide information that will be used to tune the model's hyperparameters and configurations. The model performance was later tested using the test dataset to provide unbiased final model performances. Splitting the dataset is important to prevent the model from overfitting and to accurately predict input that has not been introduced previously in the training and validation processes (Duda et al., 2000; Hastie et al., 2009). The number obtained from the test was used as an estimator of the true error of the learned predictor (Shalev-Shwartz and Ben-David, 2014). The authors used the Stratified Shuffle Split-Test Cross-Validation method. This is a combination of StratifiedKFold and ShuffleSplit that returns stratified randomized folds. Stratified splitting was used as the authors found imbalanced data distribution, and this method divides the dataset to maintain the proportion in each subset. Cross-validation is used to estimate the model performance in relation to the independent dataset when applied to the real world.

### 2.4. Taxa composition, spatial distribution and asking prices of songbird ads in the online market

The best machine-learning model was used to classify all listings from the ad database. The authors used a longer observation period of 18 months from April 2020 to September 2021 for the total ad population to optimize their understanding of the songbird market. Each ad's location was extracted to capture the spatial distribution at provincial level. To remove outliers in the asking price, the authors applied a common method that uses the Z-score approach. Any Z-score greater than 3 or less than $-3$ were considered outliers and removed. For more understanding of the current threat to songbirds, the authors linked the name list to the recent IUCN Red List of Threatened Species (HBW and BirdLife International, 2021).

### 2.5. Online seller characteristics and preferences

The authors selected respondents from the ad population using a simple random sampling technique. The process of selecting and contacting respondents continued until a predetermined number of surveys was reached in order to ensure a representative sample with a 5% margin of error at the 95% confidence level (Newing, 2010). Data were collected on demographic profiles and online market experience. Respondents who were selling native taxa were also asked about the songbird origin and their origin preferences. Respondents were contacted through the information provided in the online marketplace and were asked about their willingness to participate in the survey. Enumerators always received prior informed consent from respondents, and all data were anonymized.

## 3. Results

### 3.1. Taxa classification model

The authors manually labelled 104,957 listings and found 93% were relevant. All models showed a high level of accuracy in predicting relevant and nonrelevant ads. The models were able to classify these listings with a very high degree of accuracy, ranging from 97.1% to 99.2%. However, as the training data for relevant and nonrelevant ads were imbalanced, the authors also considered the

**Table 1**
Relevant and nonrelevant model performances (Step 1).

| Model | Accuracy | Precision | Recall | F1-score |
|---|---|---|---|---|
| SVM | 0.992 | 0.902 | 0.872 | 0.887 |
| Linear regression | 0.989 | 0.647 | 0.636 | 0.642 |
| ANN | 0.988 | 0.650 | 0.629 | 0.639 |
| GRU | 0.988 | 0.637 | 0.643 | 0.640 |
| Naive Bayesian | 0.988 | 0.823 | 0.749 | 0.779 |
| CNN | 0.985 | 0.975 | 0.653 | 0.691 |
| LSTM | 0.978 | 0.596 | 0.645 | 0.618 |
| Random forest | 0.971 | 0.647 | 0.543 | 0.583 |

score from the precision, recall and F1-score to decide on the best model to use for the first step. The Support Vector Machines (SVM) model was found to be the outperformer and was selected as the best one for the first step. Even though SVM had a lower precision score than the Naive Bayesian classifier, the recall and F1-score of SVM was higher. This means the false positive number of SVM was lower than that of the Naive Bayesian and was better in identifying the false positive. The detailed performance of each model is shown in Table 1.

In the second step, the authors manually labelled 97,553 ads from 317 taxa and ran the model from 97,349 ads after removing the records with multiple taxa. As result, all the models performed very well for identifying taxa, with accuracy ranging from 95.6% to 97.5%. As in the first step, the SVM model proved to be the most accurate. A detailed performance of each model is shown in Table 2.

### 3.2. *Taxa composition, spatial distribution and asking prices*

From the classification result on the total ad population, the authors found 326,201 records of relevant ads consisting of 284,118 songbirds and 24,608 non-songbird taxa based on the above-mentioned definition; 3351 ads from chickens and ducks; and 13,944 ads were unknown taxa. The details are provided in Appendix A. The authors identified 247 songbirds' taxa from 49 families, where 80% of taxa were native. The five most-listed taxa that represented 68% of ads were the Lovebird (*Agapornis spp.*) with 30.1%, followed by the White-rumped Shama (*Kittacincla malabarica*) with 14.7%, Canaries (*Serinus spp.*) with 14.7%, Zebra Dove (*Geopelia striata*) with 4.2%, and Oriental Magpie-robin (*Copsychus saularis*) with 4.1%. From the model result, we found 21 taxa is known as songbird competitive taxa and 63 taxa known as master bird.

The ads were recorded from 249 districts and 32 provinces in Indonesia. Java is the center of the songbird online trade, with more than 91% of ads coming from this island, followed by Sumatra with a share of 5.76%, Bali and Nusa Tenggara with 1.4%, Kalimantan with 1.5%, Sulawesi with 0.1%, and a very small number from the Maluku and Papua regions. On average, there were about 15,784 ± 4006 ads listed monthly and the 2021 trend showed a decline from the year before. (Figs. 1–3).

From the results, the authors found that 18,073 ads – or about 6.2% of total songbird ads – listed threatened species from 14 taxa, including from non-native taxa. About 1.7% of ads listed vulnerable taxa (VU), while endangered taxa (EN) accounted for 0.9%, and critically endangered species (CR) were in 3.6% of ads. The Javan pied starling (CR) was the most listed threatened species, with 2.6% of ads, followed by the Javan myna (VU) with 1.1%, the Straw-headed Bulbul (CR) with 0.9%, Red Siskin (EN) with 0.7%, and Greater-green leafbird (VU) with 0.7% of ads. These five taxa represented 94% of the total threatened species listed in the online marketplace. The authors also found 3.5% of ads listing near-threatened species (NT).

The details for Fig. 4 are provided in Appendix B. The songbird with the highest asking price was the Straw-headed Bulbul (*Pycnonotus zeylanicus*) with a mean asking price of USD 709 ± 362. But, in general, non-native taxa had higher mean asking prices such as (*Garrulax canorus*) with USD 305 ± 159, the European Goldfinch (*Carduelis carduelis*) with USD 253 ± 109, Hooded Siskin (*Spinus magellanicus*) with USD 250 ± 131, and Black-throated Laughingthrush (*Garrulax chinensis*) with USD 249 ± 92. From native taxa, there was the Bali Myna (*Leucopsar rothschildi*) with a mean asking price of USD 248 ± 117, which was the second-highest mean asking price after the Straw-headed Bulbul. The songbirds with the lowest mean asking price were the Brown-throated Sunbird (*Anthreptes malacensis*) with USD 7 ± 5 and Scaly-crowned Babbler (*Malacopteron cinereum*) with USD 7 ± 2, both of which are native taxa.

### 3.3. *Online seller characteristics and preferences*

With a survey response rate of 14%, the authors surveyed 404 respondents. Based on the database population of 284,118 ads, the margin of error was about ± 5% with a 95% confidence level (Newing, 2010). Around 96% of respondents were male with ages ranging from 17 to 68 years old and the highest distribution in class age between 31 and 40 years old. Most respondents lived in urban communities and had a high-school education or higher (94%). Of all respondents, only 7% were bird traders, the term used for respondents whose main livelihood was selling birds. (Figs. 5–7).

Most respondents have quite a lot of experience selling songbirds through online platforms. About 51% of respondents had 2–5 years' experience, and 19% had been selling for more than 5 years. As much as 92% of respondents had at least some transaction success, with 58% claiming they often succeeded in selling and 18% saying they always succeeded in selling birds through the online platform. Overall, 95% of respondents said they had experience with buyers from the same city, and 60% from different cities on the same island. The authors also found that 6% of respondents had experience selling birds to another island and 1% of respondents

**Table 2**
Taxa classification model performances (Step 2).

| Model | Accuracy | Precision | Recall | F1-score |
|---|---|---|---|---|
| SVM | 0.975 | 0.896 | 0.861 | 0.872 |
| Linear regression | 0.973 | 0.917 | 0.856 | 0.878 |
| ANN | 0.971 | 0.912 | 0.855 | 0.875 |
| GRU | 0.970 | 0.895 | 0.837 | 0.856 |
| Naive Bayes | 0.968 | 0.774 | 0.770 | 0.764 |
| CNN | 0.967 | 0.892 | 0.802 | 0.833 |
| LSTM | 0.966 | 0.858 | 0.835 | 0.842 |
| Random forest | 0.956 | 0.730 | 0.697 | 0.702 |

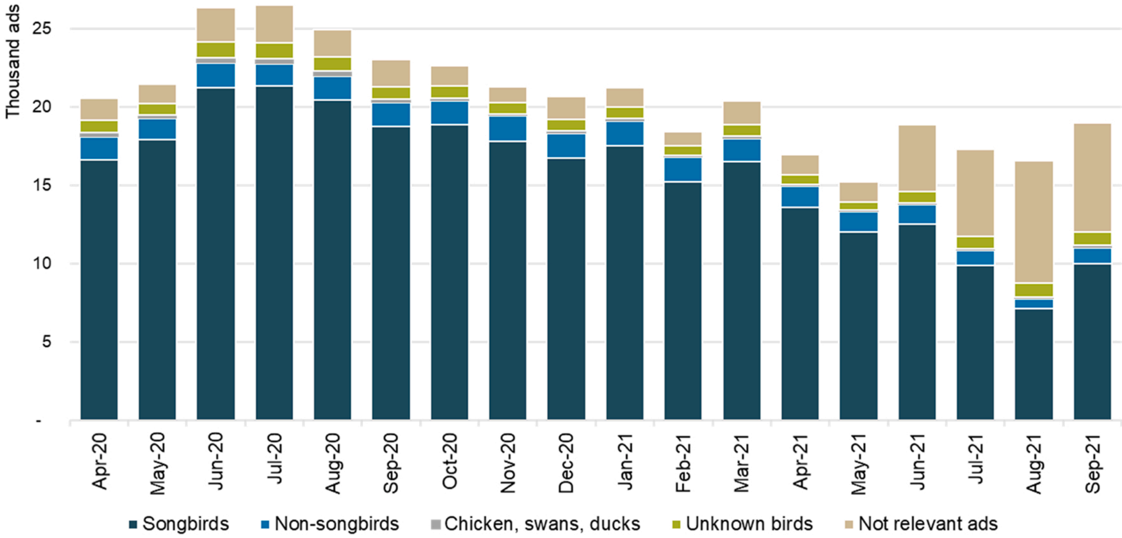


**Fig. 1.** Distribution of online market ads in the observation period.

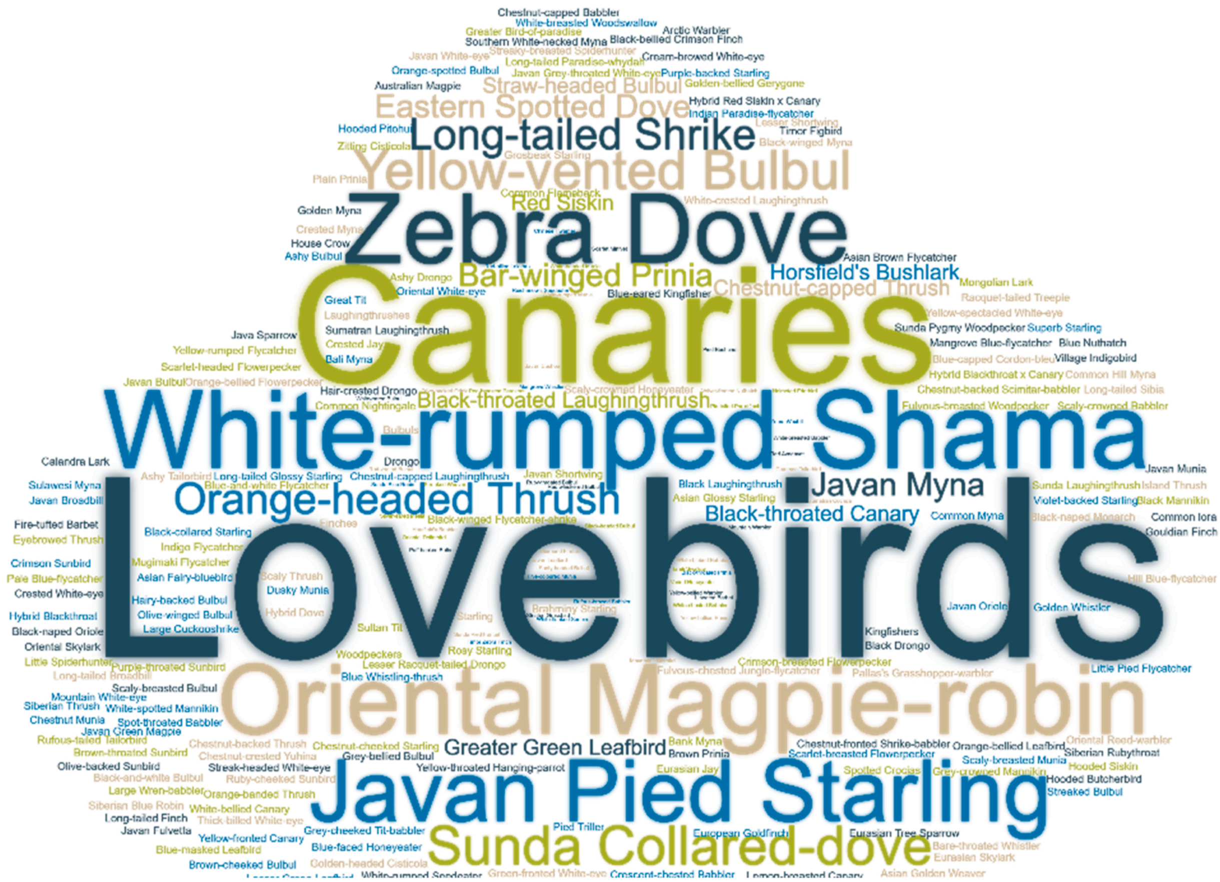


**Fig. 2.** Listed songbird taxa.

selling overseas. Cash on delivery (COD) was the most common method (94%) used for transactions. The motivations for selling the birds included: (a) bird traders pursuing their main livelihood, (b) to earn extra income, (c) to make bird sales from breeding, (d) the desire for a change of bird, either to the same species or a different species, and (e) to reduce the number of birds the sellers owned. The

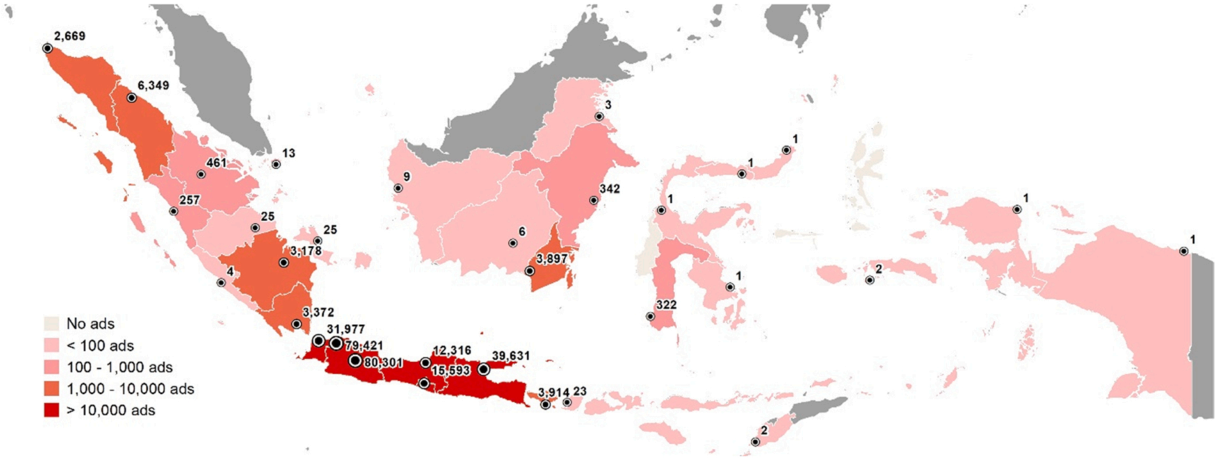


**Fig. 3.** Spatial distribution of songbird ads (by province).

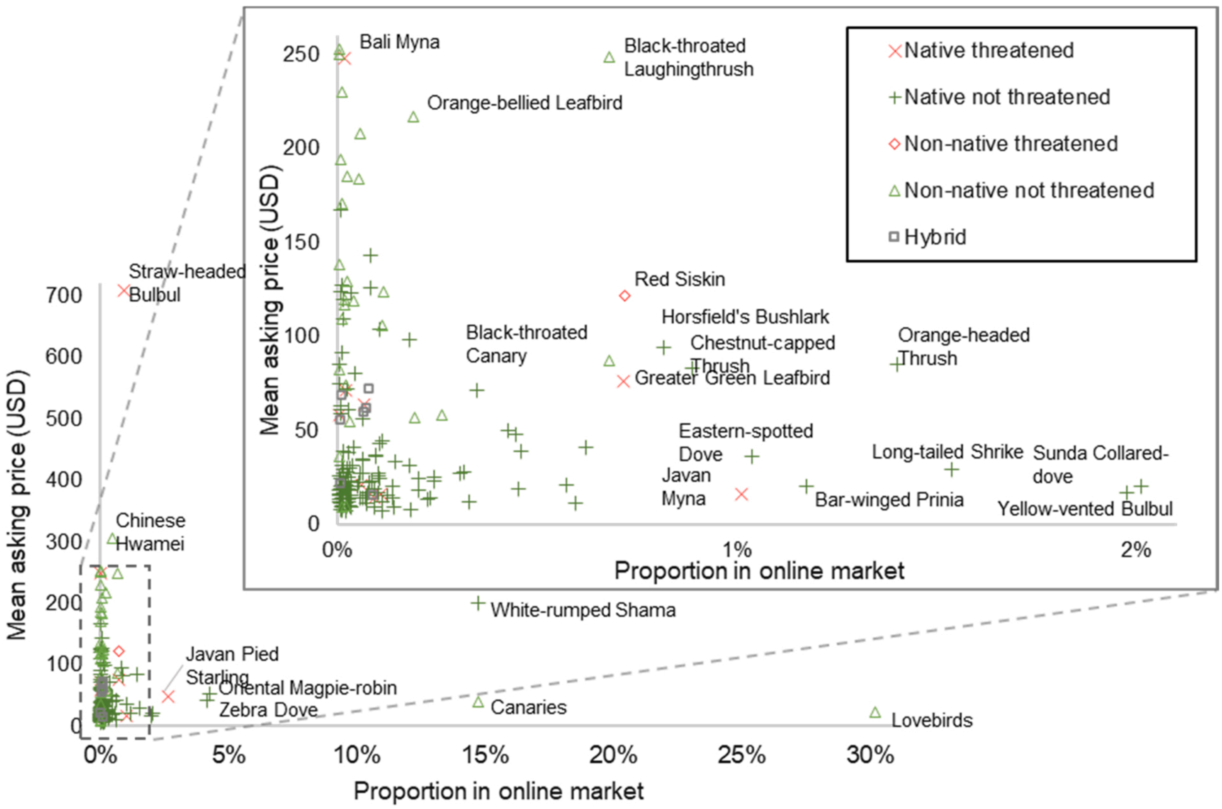


**Fig. 4.** Taxa compositions with distribution of mean asking prices in online market.

reasons for using online marketplace included: (a) to reach more potential customers, (b) to sell the birds relatively fast, and (c) the online market is simple and easy to use.

The authors asked the respondents selling native taxa songbirds about the listed songbirds' origin. About 79% said they were the captive-bred, 14% were wild-caught and the rest said they did not know where the birds came from. Around 71% of bird traders preferred to sell captive-bred songbirds, 11% preferred wild-caught ones, and 18% had no preference. As the non-trader respondents were hobbyists and breeders, the authors also asked about the origin they preferred. About 81% said they preferred captive-bred birds, 3% preferred wild-caught and 16% had no preference. Around 62% of respondents were breeders, most of whom bred non-native species, such as Lovebirds and Canaries, while 8% of respondents were also poachers. About 45% of respondents had participated in songbird singing competitions.

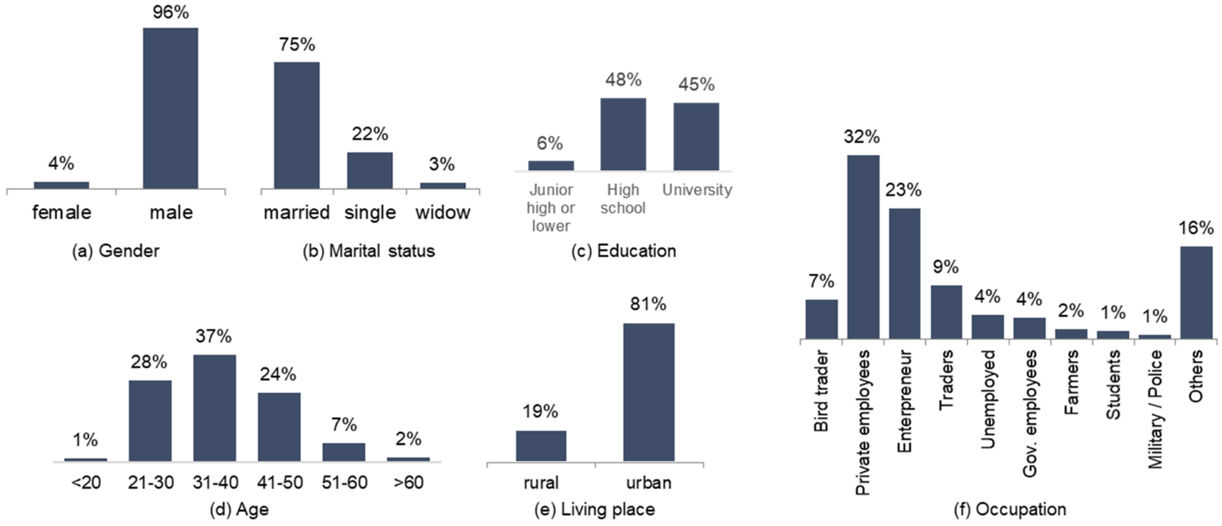


**Fig. 5.** Online seller profiles for the songbird trade.

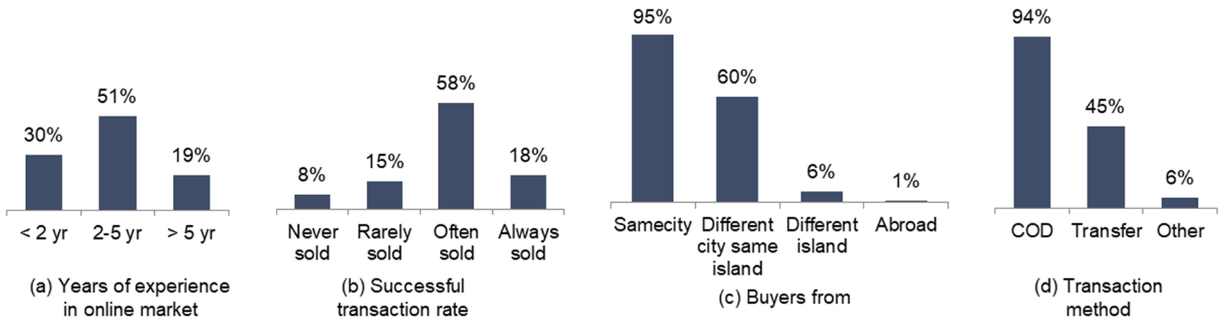


**Fig. 6.** Respondent experience in the online market.

## 4. Discussion

The study demonstrated that machine learning is very effective in monitoring the songbird trade in the online market. Regular monitoring is crucial to understand market dynamics and species composition, and results from the study's model could provide such data in an automated manner. The model could accurately and quickly identify hundreds of songbird taxa listed in the online marketplace. However, this model is having limitation in predicting total number of listed individuals. The model can only predict one individual per ad record while the authors found there are ads that listing more than one individual per record. In the labelling process, the authors found less than 1% of ad records with more than one individual in an ad. The model prediction is also limited to the list of taxa provided in training datasets.

In general, the taxa composition in the online marketplace was relevant to taxa abundance of the caged bird inventory results from the recent study of Marshall et al. (2020b). Popular taxa, such as Lovebirds, Canaries, Zebra Doves, White-rumped Shama, and Oriental Magpie-robin dominate the online market. The domination of non-native taxa, such as Lovebirds and Canaries, was likely because they are known to be profitable and are easy to breed and sell (Marshall et al., 2020a). The survey also indicated most breeder respondents bred these two taxa. However, although species trend is relevant with existing caged bird inventories in Marshall et al. (2020b)., our results here may not reflect the actual condition in physical markets and we consider our result as complementary data to existing data from physical market survey.

The results confirmed that Java is the largest online songbird market which relevant with the fact that songbird trade at physical bird market in Java are more abundant and larger than any other places in Indonesia. The popularity of songbird trade in Java Island is also relevant with songbird-keeping culture and rise of songbird competition in Java. The trend of using online platforms to sell songbirds in Java is consistent with the results of Yahya and Sugiyanto (2020), showing that people who lived in Java, particularly in urban areas, were more likely to shop online. In the future, when the gap across regions narrows as the digital economy and telecommunications infrastructure develop, more songbird ads may be placed from outside Java. This also means the market for wild-caught birds – mostly supplied from regions outside Java, as indicated by studies from Bušina et al. (2018) and Rentschlar et al. (2018), – will be bigger and increase the threat to the wild population.

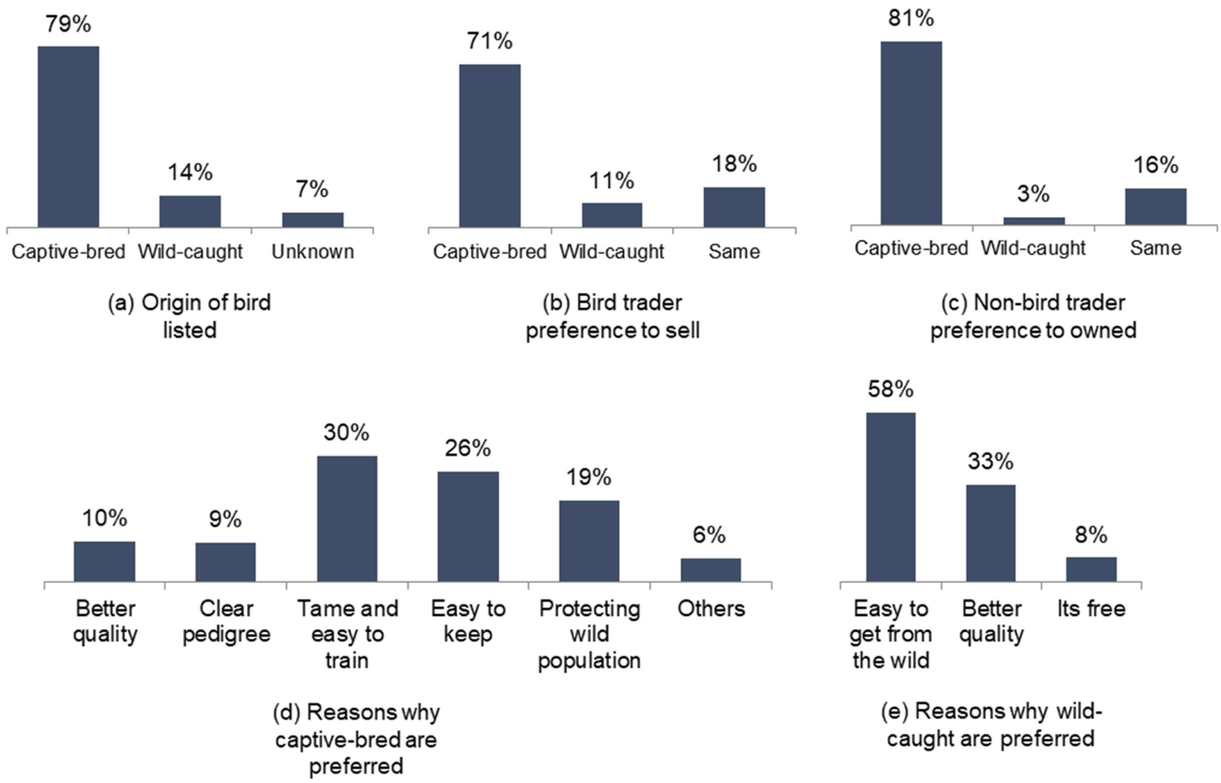


**Fig. 7.** Songbird origin, respondent preferences and reasons.

Overall, the asking price for each taxon was varied for many reasons. It sometimes included a cage, offered multiple individual birds in an ad, the songbirds' sex, and maturity. Rare conditions, like albinism and individual achievement, also made the asking price range can be very wide. Sub-species also create differences in the asking price, as found in Horsfield's Bushlark (*Mirafra javanica*) where *Mirafra javanica javanica* had a higher price than *Mirafra javanica parva*.

In economic theory, supply and demand influence the price, and taxa rarity will likely increase prices. The top list of songbirds with high asking prices is dominated by non-native taxa, except for Lovebirds and Canaries. Limited supply and import quotas for these taxa might lead to restricted stock in the market, as indicated by the low number of ads in the online market, and mean the asking prices from this group are high. For native taxa, the authors found that songbirds with high asking prices were threatened species and popular taxa for songbird competitions. However, the status of threatened species – which indicates a threat and low abundance in the wild population – is not always related to the asking price, as shown in the study. Several native threatened species had relatively low asking prices, such as the Ruby-throated Bulbul (VU) with USD 14 $\pm$ 10, Javan Myna (VU) with USD 16 $\pm$ 10, the Java Sparrow (EN) with USD 16 $\pm$ 10, and the Javan White-eye (EN) with USD 21 $\pm$ 17. This shows that the anthropogenic Allee effect (Courchamp et al., 2006), where the taxa rarity increases the economic value, did not affect all threatened songbird species. In this case, the songbird keeper's preference, that set the characteristic of supply in the online market, probably contributes more to determining the market prices rather than conservation status.

Songbird singing contests are considered one of the reasons for the increased of songbird trade and lead to the declining of wild population. The promotion of singing competitions between captive-bred birds has been recommended to reduce the demand for native species from wild-caught taxa, such as the White-rumped Shama (Burivalova et al., 2017). However, songbird competitions not only threaten the competitive taxa but also other non-competitive taxa that are used as master birds, which train the competitive taxa to imitate songs. The authors found a lot of ads mentioning this term. Master birds have less concern compared with the competitive taxa, and several master bird taxa are facing a serious threat of extinction in the wild – such as the Black-winged Starling (CR), Javan Green Magpie (CR), Java Sparrow (EN) and Ruby-throated Bulbul (VU) – or are known to have a seriously declining wild population, such as the Crested Shrikejay (NT) and the Yellow-throated Hanging-Parrot (NT).

The study shows online seller respondents are mainly middle-aged males who live in urban areas and had a high-school or university education. Most of them were hobbyists selling songbirds for some extra income and had been using online platforms for quite a long time. They often succeeded in selling songbirds and thought that the online marketplace was an effective and easy-to-use way to reach potential customers. The risk of fraud in using the online market was minimized by paying COD, whereby the buyer meets the seller directly before doing the transaction. But many of them also carried out online transactions based on trust. Few of them regularly conduct international trade with neighboring countries, such as Thailand and Malaysia. The study suggests that the major demographic group of songbird online sellers is also the major Internet user group in Indonesia. However, this condition is not reflecting condition in physical bird market because there are sellers or hobbyist that not willing nor able to use online marketplace for selling bird. Nevertheless, raising awareness about the risk of songbird extinction and promoting sustainable songbird trade through online media will encourage the target audience to help reduce the risks from the wildlife trade.

The survey results showed the songbirds listed were mostly captive-bred and were preferred for sale and ownership. The authors also found 19% of respondents said protecting the wild population from extinction was the reason why they preferred captive-bred songbirds. However, a low response rate in the survey can give rise to sampling bias. The authors also considered the possibility that contacted sellers who refused to be a respondent were reluctant to participate because they were selling wild-caught songbirds. Most online sellers who were willing to be respondents were selling captive-bred songbirds. Questions about sensitive information, such as songbird origin, may also cause reluctant respondents to rush through the survey as quickly as possible, leading to poor and inaccurate conclusions (Tourangeau et al., 2010).

Online platforms are expanding the songbird market. The authors found 93% of respondents were hobbyists or breeders who sold birds to earn extra income or to exchange their pet. Since most current studies of the songbird market were conducted in physical bird markets (Chng et al., 2015, 2018; Chng and Eaton, 2016; Nijman et al., 2021; Rentschlar et al., 2018; Yohanna et al., 2021), transactions by the non-bird traders or among hobbyists or breeders were missing from the observational data. The survey results on respondents' experience of successful transactions and how the respondent could reach buyers from other cities or even other countries suggest that the online marketplace has potential and will likely continue to grow. This means market monitoring also needs to be extended to the online market and, as far as the authors are aware, there no applied system or platform is identified for monitoring online songbird market to date. As the study indicates, since a lot of threatened taxa are listed, a monitoring platform is urgently needed. Realistically, Indonesia's bird trade is too economically and culturally important to be stopped completely (Marshall et al., 2020a,2020b). Therefore, a robust and effective monitoring platform is needed to support a sustainable songbird trade, and this study has demonstrated a monitoring framework that can meet this need. However, data collection using web-scrapping should consider also the context of the privacy data policy in the source website and the country where the location of research is implemented. Privacy policy may restrict the disclosure of information, although the information is public and personally provide by people in the online platform.

## 5. Conclusions

The authors' model has demonstrated that machine learning is viable to monitor the songbird online market. All the tested models showed a high level of accuracy in distinguishing relevant ads, and identified SVM as the best performing model. Based on the model prediction result from the ad population, the composition of songbird species in the online market is closely related to the caged bird abundance in the physical market. The trend is similar, but our results are not representing the number of trade in actual physical market. Beside the species composition, further analysis of advertisement data also able to provide information related to geographical condition, selling price, and seller information. These information is important as overview of online market condition for monitoring purposes. Since online platforms are a promising marketing channel for selling songbirds based on respondents' survey, a monitoring framework is needed to support the sustainable trade of songbirds. Coupled with big data analysis, the machine learning model in this study offers an effective way to regularly monitor the online songbird market and provides updated market data as input for stakeholders to assess existing conservation strategies and to formulate corrective action, if necessary.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data Availability

Data will be made available on request.

## Appendix A. Full list of taxa listed in online marketplace

| No | Common Name | Scientific Name | IUCN Status | Num of listed | % of listed |
|---|---|---|---|---|---|
| 1 | Lovebirds* | *Agapornis spp.* | X | 85,740 | 30.18 |
| 2 | White-rumped Shama | *Kittacincla malabarica* | LC | 41,877 | 14.74 |
| 3 | Canaries* | *Serinus spp.* | X | 41,868 | 14.74 |

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| No | Common Name | Scientific Name | IUCN Status | Num of listed | % of listed |
|---|---|---|---|---|---|
| 4 | Oriental Magpie-robin | *Copsychus saularis* | LC | 12,029 | 4.23 |
| 5 | Zebra Dove | *Geopelia striata* | LC | 11,795 | 4.15 |
| 6 | Javan Pied Starling | *Gracupica jalla* | CR | 7424 | 2.61 |
| 7 | Sunda Collared-dove | *Streptopelia bitorquata* | LC | 5715 | 2.01 |
| 8 | Yellow-vented Bulbul | *Pycnonotus goiavier* | LC | 5617 | 1.98 |
| 9 | Long-tailed Shrike | *Lanius schach* | LC | 4364 | 1.54 |
| 10 | Orange-headed Thrush | *Geokichla citrina* | LC | 3983 | 1.40 |
| 11 | Bar-winged Prinia | *Prinia familiaris* | NT | 3334 | 1.17 |
| 12 | Eastern Spotted Dove | *Spilopelia chinensis* | LC | 2943 | 1.04 |
| 13 | Javan Myna | *Acridotheres javanicus* | VU | 2870 | 1.01 |
| 14 | Straw-headed Bulbul | *Pycnonotus zeylanicus* | CR | 2654 | 0.93 |
| 15 | Chestnut-capped Thrush | *Geokichla interpres* | NT | 2520 | 0.89 |
| 16 | Horsfield's Bushlark | *Mirafra javanica* | LC | 2321 | 0.82 |
| 17 | Red Siskin* | *Spinus cucullatus* | EN | 2038 | 0.72 |
| 18 | Greater Green Leafbird | *Chloropsis sonnerati* | VU | 2035 | 0.72 |
| 19 | Black-throated Canary* | *Crithagra atrogularis* | LC | 1933 | 0.68 |
| 20 | Black-throated Laughingthrush* | *Garrulax chinensis* | LC | 1932 | 0.68 |
| 21 | Brown-cheeked Bulbul | *Alophoixus bres* | LC | 1767 | 0.62 |
| 22 | Sooty-headed Bulbul | *Pycnonotus aurigaster* | LC | 1691 | 0.60 |
| 23 | Black-throated Prinia | *Prinia atrogularis* | LC | 1624 | 0.57 |
| 24 | Black-naped Oriole | *Oriolus chinensis* | LC | 1303 | 0.46 |
| 25 | Chinese Hwamei* | *Garrulax canorus* | LC | 1288 | 0.45 |
| 26 | Common Iora | *Aegithina tiphia* | LC | 1287 | 0.45 |
| 27 | Olive-winged Bulbul | *Pycnonotus plumosus* | LC | 1271 | 0.45 |
| 28 | Hill Blue-flycatcher | *Cyornis banyumas* | LC | 1211 | 0.43 |
| 29 | Starlings | *Sturnus spp.* | X | 989 | 0.35 |
| 30 | Ashy Tailorbird | *Orthotomus ruficeps* | LC | 938 | 0.33 |
| 31 | Timor Zebra Finch | *Taeniopygia guttata* | LC | 896 | 0.32 |
| 32 | Common Myna | *Acridotheres tristis* | LC | 868 | 0.31 |
| 33 | White-rumped Seedeater* | *Crithagra leucopygia* | LC | 744 | 0.26 |
| 34 | Chestnut-capped Laughingthrush | *Garrulax mitratus* | NT | 686 | 0.24 |
| 35 | Purple-throated Sunbird | *Leptocoma sperata* | LC | 682 | 0.24 |
| 36 | Great Tit | *Parus major* | LC | 661 | 0.23 |
| 37 | Plain Prinia | *Prinia inornata* | LC | 639 | 0.22 |
| 38 | White-rumped Munia | *Lonchura striata* | LC | 578 | 0.20 |
| 39 | Asian Glossy Starling | *Aplonis panayensis* | LC | 575 | 0.20 |
| 40 | Yellow-fronted Canary* | *Crithagra mozambica* | LC | 544 | 0.19 |
| 41 | Orange-bellied Leafbird* | *Chloropsis hardwickii* | LC | 542 | 0.19 |
| 42 | Scarlet-headed Flowerpecker | *Dicaeum trochileum* | LC | 522 | 0.18 |
| 43 | Bare-throated Whistler | *Pachycephala nudigula* | LC | 511 | 0.18 |
| 44 | Fulvous-chested Jungle-flycatcher | *Cyornis olivaceus* | LC | 509 | 0.18 |
| 45 | Pied Bushchat | *Saxicola caprata* | LC | 406 | 0.14 |
| 46 | Common Tailorbird | *Orthotomus sutorius* | LC | 403 | 0.14 |
| 47 | Eurasian Tree Sparrow | *Passer montanus* | LC | 389 | 0.14 |
| 48 | Orange-spotted Bulbul | *Pycnonotus bimaculatus* | NT | 386 | 0.14 |
| 49 | Asian Golden Weaver | *Ploceus hypoxanthus* | NT | 353 | 0.12 |
| 50 | Laughingthrushes* | *Garrulax spp.* | X | 322 | 0.11 |
| 51 | Gouldian Finch* | *Chloebia gouldiae* | NT | 318 | 0.11 |
| 52 | Brown-throated Sunbird | *Geokichla dohertyi* | LC | 314 | 0.11 |
| 53 | Chestnut-backed Thrush | *Anthreptes malacensis* | NT | 314 | 0.11 |
| 54 | Javan Fulvetta | *Alcippe pyrrhoptera* | LC | 314 | 0.11 |
| 55 | Java Sparrow | *Lonchura oryzivora* | EN | 305 | 0.11 |
| 56 | Asian Fairy-bluebird | *Irena puella* | LC | 302 | 0.11 |
| 57 | Blue-and-white Flycatcher | *Cyanoptila cyanomelana* | LC | 296 | 0.10 |
| 58 | Hooded Pitohui | *Pitohui dichrous* | LC | 296 | 0.10 |
| 59 | Lesser Green Leafbird | *Chloropsis cyanopogon* | NT | 293 | 0.10 |
| 60 | Oriental White-eye | *Zosterops palpebrosus* | LC | 289 | 0.10 |
| 61 | Grosbeak Starling | *Scissirostrum dubium* | LC | 288 | 0.10 |
| 62 | Sunda Laughingthrush | *Garrulax palliatus* | NT | 274 | 0.10 |
| 63 | Blue-masked Leafbird | *Chloropsis venusta* | NT | 268 | 0.09 |
| 64 | Streaked Bulbul | *Ixos malaccensis* | NT | 264 | 0.09 |
| 65 | White-headed Munia | *Lonchura maja* | LC | 264 | 0.09 |
| 66 | Ruby-throated Bulbul | *Pycnonotus dispar* | VU | 260 | 0.09 |
| 67 | Hybrid Eastern-spotted Dove x Sunda Collared-dove | | X | 250 | 0.09 |
| 68 | Javan Leafbird | *Chloropsis cochinchinensis* | NT | 241 | 0.08 |
| 69 | Hooded Butcherbird | *Cracticus cassicus* | LC | 235 | 0.08 |
| 70 | Crested Jay | *Platylophus galericulatus* | NT | 231 | 0.08 |
| 71 | Oriental Reed-warbler | *Acrocephalus orientalis* | LC | 221 | 0.08 |
| 72 | Hybrid Red Siskin x Island Canary | | NR | 216 | 0.08 |
| 73 | Pale Blue-flycatcher | *Cyornis unicolor* | LC | 213 | 0.08 |

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| No | Common Name | Scientific Name | IUCN Status | Num of listed | % of listed |
|---|---|---|---|---|---|
| 74 | Scarlet Minivet | *Pericrocotus flammeus* | LC | 210 | 0.07 |
| 75 | Black-headed Bulbul | *Brachypodius atriceps* | LC | 206 | 0.07 |
| 76 | Hybrid Black-throated Canary x White-rumped Seedeater | | NR | 203 | 0.07 |
| 77 | Javan Grey-throated White-eye | *Heleia javanica* | LC | 203 | 0.07 |
| 78 | Javan Munia | *Lonchura leucogastroides* | LC | 194 | 0.07 |
| 79 | Hybrid Black-throated Canary x Island Canary | | NR | 186 | 0.07 |
| 80 | Black-winged Myna | *Acridotheres melanopterus* | CR | 185 | 0.07 |
| 81 | Racquet-tailed Treepie | *Crypsirina temia* | LC | 182 | 0.06 |
| 82 | Orange-banded Thrush | *Geokichla peronii* | NT | 181 | 0.06 |
| 83 | Blue Whistling-thrush | *Myophonus caeruleus* | LC | 180 | 0.06 |
| 84 | Chestnut-crested Yuhina | *Yuhina everetti* | LC | 180 | 0.06 |
| 85 | Purple-backed Starling | *Agropsar sturninus* | LC | 177 | 0.06 |
| 86 | Javan White-eye | *Zosterops flavus* | EN | 173 | 0.06 |
| 87 | Black-collared Starling* | *Gracupica nigricollis* | LC | 163 | 0.06 |
| 88 | Lesser Shortwing | *Brachypteryx leucophris* | LC | 163 | 0.06 |
| 89 | Drongos | *Dicrurus spp.* | X | 162 | 0.06 |
| 90 | Velvet-fronted Nuthatch | *Sitta frontalis* | LC | 152 | 0.05 |
| 91 | Spot-throated Babbler* | *Pellorneum albiventre* | LC | 151 | 0.05 |
| 92 | White-breasted Woodswallow | *Artamus leucoryn* | LC | 143 | 0.05 |
| 93 | Silver-eared Mesia | *Leiothrix argentauris* | LC | 127 | 0.04 |
| 94 | Red-billed Leiothrix* | *Leiothrix lutea* | LC | 118 | 0.04 |
| 95 | Lesser Racquet-tailed Drongo | *Dicrurus remifer* | LC | 110 | 0.04 |
| 96 | Mangrove Blue-flycatcher | *Cyornis rufigastra* | LC | 103 | 0.04 |
| 97 | Scaly-crowned Honeyeater | *Lichmera lombokia* | LC | 99 | 0.03 |
| 98 | Ashy Drongo | *Dicrurus leucophaeus* | LC | 96 | 0.03 |
| 99 | Red Avadavat | *Amandava amandava* | LC | 96 | 0.03 |
| 100 | Chestnut-capped Babbler | *Timalia pileata* | LC | 94 | 0.03 |
| 101 | House Crow | *Corvus splendens* | LC | 93 | 0.03 |
| 102 | Zitting Cisticola | *Cisticola juncidis* | LC | 86 | 0.03 |
| 103 | Finches* | | X | 85 | 0.03 |
| 104 | Long-tailed Sibia | *Heterophasia picaoides* | LC | 83 | 0.03 |
| 105 | Mugimaki Flycatcher | *Ficedula mugimaki* | LC | 83 | 0.03 |
| 106 | Hair-crested Drongo | *Dicrurus hottentottus* | LC | 81 | 0.03 |
| 107 | Streaked Weaver | *Ploceus manyar* | LC | 81 | 0.03 |
| 108 | Javan Bulbul | *Ixos virescens* | LC | 80 | 0.03 |
| 109 | Woodpeckers | | X | 79 | 0.03 |
| 110 | Thick-billed White-eye | *Heleia crassirostris* | LC | 77 | 0.03 |
| 111 | Helmeted Friarbird | *Philemon buceroides* | LC | 75 | 0.03 |
| 112 | Pin-tailed Parrotfinch | *Erythrura prasina* | LC | 75 | 0.03 |
| 113 | Horsfield's Babbler | *Malacocincla sepiaria* | LC | 71 | 0.02 |
| 114 | Indigo Flycatcher | *Eumyias indigo* | LC | 69 | 0.02 |
| 115 | Sulawesi Myna | *Basilornis celebensis* | LC | 68 | 0.02 |
| 116 | Calandra Lark* | *Melanocorypha calandra* | LC | 67 | 0.02 |
| 117 | Blue Nuthatch | *Sitta azurea* | LC | 66 | 0.02 |
| 118 | Common Flameback | *Dinopium javanense* | LC | 66 | 0.02 |
| 119 | Oriental Skylark* | *Alauda gulgula* | LC | 66 | 0.02 |
| 120 | Sunda Pygmy Woodpecker | *Picoides moluccensis* | LC | 66 | 0.02 |
| 121 | Black Drongo | *Dicrurus macrocercus* | LC | 64 | 0.02 |
| 122 | Chestnut-backed Scimitar-babbler | *Pomatorhinus montanus* | LC | 64 | 0.02 |
| 123 | Ruby-cheeked Sunbird | *Chalcoparia singalensis* | LC | 61 | 0.02 |
| 124 | Crested Myna* | *Acridotheres cristatellus* | LC | 60 | 0.02 |
| 125 | Scaly-crowned Babbler | *Malacopteron cinereum* | LC | 59 | 0.02 |
| 126 | Javan Green Magpie | *Cissa thalassina* | CR | 58 | 0.02 |
| 127 | White-bibbed Babbler | *Stachyris thoracica* | LC | 58 | 0.02 |
| 128 | Ashy Bulbul | *Hemixos flavala* | LC | 57 | 0.02 |
| 129 | Mountain Warbler* | *Phylloscopus trivirgatus* | LC | 57 | 0.02 |
| 130 | Orange-bellied Flowerpecker | *Dicaeum trigonostigma* | LC | 55 | 0.02 |
| 131 | Bali Myna | *Leucopsar rothschildi* | CR | 50 | 0.02 |
| 132 | Long-tailed Paradise-whydah* | *Vidua paradisaea* | LC | 50 | 0.02 |
| 133 | Siberian Thrush | *Geokichla sibirica* | LC | 47 | 0.02 |
| 134 | Lemon-breasted Canary* | *Crithagra citrinipectus* | LC | 46 | 0.02 |
| 135 | Yellow-bellied Prinia | *Prinia flaviventris* | LC | 44 | 0.02 |
| 136 | Brown Prinia | *Prinia polychroa* | LC | 43 | 0.02 |
| 137 | Golden Whistler | *Pachycephala pectoralis* | LC | 42 | 0.01 |
| 138 | Sunda Blue Robin | *Myiomela diana* | LC | 40 | 0.01 |
| 139 | Timor Figbird | *Sphecotheres viridis* | LC | 39 | 0.01 |
| 140 | Javan Oriole | *Oriolus cruentus* | LC | 38 | 0.01 |
| 141 | Olive-backed Sunbird | *Cinnyris jugularis* | LC | 37 | 0.01 |
| 142 | White-crested Laughingthrush | *Garrulax leucolophus* | LC | 37 | 0.01 |
| 143 | Black Laughingthrush | *Garrulax lugubris* | LC | 36 | 0.01 |

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| No | Common Name | Scientific Name | IUCN Status | Num of listed | % of listed |
|---|---|---|---|---|---|
| 144 | Little Pied Flycatcher | *Ficedula westermanni* | LC | 35 | 0.01 |
| 145 | Golden-bellied Gerygone | *Gerygone sulphurea* | LC | 34 | 0.01 |
| 146 | Oriental Dollarbird | *Eurystomus orientalis* | LC | 34 | 0.01 |
| 147 | Scaly-breasted Munia | *Lonchura punctulata* | LC | 34 | 0.01 |
| 148 | Chestnut Munia* | *Lonchura atricapilla* | LC | 32 | 0.01 |
| 149 | Crested White-eye | *Heleia dohertyi* | LC | 32 | 0.01 |
| 150 | Sunda Pied Fantail | *Rhipidura javanica* | LC | 32 | 0.01 |
| 151 | Fulvous-breasted Woodpecker | *Dendrocopos macei* | LC | 31 | 0.01 |
| 152 | Grey-cheeked Tit-babbler | *Mixornis flavicollis* | LC | 31 | 0.01 |
| 153 | Pied Triller | *Lalage nigra* | LC | 31 | 0.01 |
| 154 | White-breasted Babbler | *Stachyris grammiceps* | NT | 31 | 0.01 |
| 155 | Mangrove Whistler | *Pachycephala cinerea* | LC | 30 | 0.01 |
| 156 | Golden-headed Cisticola | *Cisticola exilis* | LC | 29 | 0.01 |
| 157 | Large Wren-babbler | *Turdinus macrodactylus* | NT | 29 | 0.01 |
| 158 | Little Spiderhunter | *Arachnothera longirostra* | LC | 29 | 0.01 |
| 159 | Hybrid Black-throated Canary x Yellow-fronted Seedeater | | X | 28 | 0.01 |
| 160 | Long-tailed Finch* | *Poephila acuticauda* | LC | 27 | 0.01 |
| 161 | Streaky-breasted Spiderhunter | *Arachnothera affinis* | LC | 27 | 0.01 |
| 162 | Common Hill Myna | *Gracula religiosa* | LC | 26 | 0.01 |
| 163 | Eurasian Skylark* | *Alauda arvensis* | LC | 26 | 0.01 |
| 164 | Superb Starling* | *Lamprotornis superbus* | LC | 26 | 0.01 |
| 165 | Crimson Sunbird | *Aethopyga siparaja* | LC | 25 | 0.01 |
| 166 | Eyebrowed Thrush | *Turdus obscurus* | LC | 23 | 0.01 |
| 167 | Grey-bellied Bulbul | *Pycnonotus cyaniventris* | NT | 22 | 0.01 |
| 168 | Javan Shortwing | *Brachypteryx montana* | LC | 21 | 0.01 |
| 169 | Southern White-necked Myna | *Streptocitta albicollis* | LC | 21 | 0.01 |
| 170 | Yellow-bellied Warbler | *Abroscopus superciliaris* | LC | 21 | 0.01 |
| 171 | Brahminy Starling* | *Sturnia pagodarum* | LC | 20 | 0.01 |
| 172 | Golden Myna | *Mino anais* | LC | 20 | 0.01 |
| 173 | Hybrid White-rumped Seedeater x Yellow-fronted Seedeater | | NR | 20 | 0.01 |
| 174 | Red-breasted Parakeet | *Psittacula alexandri* | NT | 20 | 0.01 |
| 175 | Large Cuckooshrike | *Coracina javensis* | LC | 19 | 0.01 |
| 176 | Bulbuls | *Pycnototus spp.* | NR | 18 | 0.01 |
| 177 | Mountain White-eye | *Zosterops montanus* | X | 18 | 0.01 |
| 178 | Rufous-tailed Tailorbird | *Orthotomus sericeus* | LC | 17 | 0.01 |
| 179 | Siberian Blue Robin | *Larvivora cyane* | LC | 17 | 0.01 |
| 180 | Yellow-rumped Flycatcher | *Ficedula zanthopygia* | LC | 17 | 0.01 |
| 181 | European Goldfinch* | *Carduelis carduelis* | LC | 16 | 0.01 |
| 182 | Pallas's Grasshopper-warbler | *Locustella certhiola* | LC | 16 | 0.01 |
| 183 | Rosy Starling* | *Pastor roseus* | LC | 16 | 0.01 |
| 184 | Hybrid Rock Dove x Sunda Collared-dove | | X | 15 | 0.01 |
| 185 | Striated Grassbird | *Megalurus palustris* | LC | 15 | 0.01 |
| 186 | Village Indigobird* | *Vidua chalybeata* | LC | 15 | 0.01 |
| 187 | Black-bellied Crimson Finch | *Neochmia phaeton* | LC | 14 | 0.00 |
| 188 | Blue-eared Kingfisher | *Alcedo meninting* | LC | 14 | 0.00 |
| 189 | Mountain Tailorbird | *Phyllergates cucullatus* | LC | 14 | 0.00 |
| 190 | Chestnut-fronted Shrike-babbler | *Pteruthius aenobarbus* | LC | 13 | 0.00 |
| 191 | Crescent-chested Babbler | *Cyanoderma melanothorax* | LC | 13 | 0.00 |
| 192 | Dusky Munia | *Lonchura fuscans* | LC | 13 | 0.00 |
| 193 | Hooded Siskin* | *Spinus magellanicus* | LC | 13 | 0.00 |
| 194 | Bank Myna* | *Acridotheres ginginianus* | LC | 12 | 0.00 |
| 195 | Varied Honeyeater | *Gavicalis versicolor* | LC | 12 | 0.00 |
| 196 | Sumatran Laughingthrush | *Garrulax bicolor* | EN | 11 | 0.00 |
| 197 | Javan Broadbill | *Eurylaimus javanicus* | NT | 10 | 0.00 |
| 198 | Black Mannikin | *Lonchura stygia* | NT | 9 | 0.00 |
| 199 | Black-winged Flycatcher-shrike | *Hemipus hirundinaceus* | LC | 9 | 0.00 |
| 200 | Crimson-breasted Flowerpecker | *Prionochilus percussus* | LC | 9 | 0.00 |
| 201 | Mongolian Lark* | *Melanocorypha mongolica* | LC | 9 | 0.00 |
| 202 | Rufous-browed Babbler | *Pellorneum capistratum* | LC | 8 | 0.00 |
| 203 | Javan Cochoa | *Cochoa azurea* | VU | 7 | 0.00 |
| 204 | Arctic Warbler | *Phylloscopus borealis* | LC | 7 | 0.00 |
| 205 | Blue-capped Cordon-bleu* | *Uraeginthus cyanocephalus* | LC | 7 | 0.00 |
| 206 | Scarlet-breasted Flowerpecker | *Prionochilus thoracicus* | NT | 6 | 0.00 |
| 207 | Grey-crowned Mannikin | *Lonchura nevermanni* | LC | 6 | 0.00 |
| 208 | Hairy-backed Bulbul | *Tricholestes criniger* | LC | 6 | 0.00 |
| 209 | Kingfishers | *Alcedo spp.* | X | 6 | 0.00 |
| 210 | Lineated Barbet | *Psilopogon lineatus* | LC | 6 | 0.00 |
| 211 | Australian Magpie | *Gymnorhina tibicen* | LC | 5 | 0.00 |
| 212 | Blue-faced Honeyeater | *Entomyzon cyanotis* | LC | 5 | 0.00 |
| 213 | Five-coloured Munia | *Lonchura quinticolor* | LC | 5 | 0.00 |

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| No | Common Name | Scientific Name | IUCN Status | Num of listed | % of listed |
|---|---|---|---|---|---|
| 214 | Red-whiskered Bulbul* | *Pycnonotus jocosus* | LC | 5 | 0.00 |
| 215 | Scaly Thrush | *Zoothera dauma* | LC | 5 | 0.00 |
| 216 | Puff-backed Bulbul | *Euptilotus eutilotus* | NT | 4 | 0.00 |
| 217 | Chestnut-cheeked Starling* | *Agropsar philippensis* | LC | 4 | 0.00 |
| 218 | Common Nightingale* | *Luscinia megarhynchos* | LC | 4 | 0.00 |
| 219 | Greater Bird-of-paradise | *Paradisaea apoda* | LC | 4 | 0.00 |
| 220 | Long-tailed Broadbill | *Psarisomus dalhousiae* | LC | 4 | 0.00 |
| 221 | White-eared Bulbul* | *Pycnonotus leucotis* | LC | 4 | 0.00 |
| 222 | Sumatran Cochoa | *Cochoa beccarii* | VU | 3 | 0.00 |
| 223 | Black-and-white Bulbul | *Microtarsus melanoleucos* | NT | 3 | 0.00 |
| 224 | Indian Paradise-flycatcher | *Terpsiphone paradisi* | LC | 3 | 0.00 |
| 225 | Island Thrush | *Turdus poliocephalus* | LC | 3 | 0.00 |
| 226 | Olive-backed Oriole | *Oriolus sagittatus* | LC | 3 | 0.00 |
| 227 | White-bellied Canary* | *Crithagra dorsostriata* | LC | 3 | 0.00 |
| 228 | White-spotted Mannikin | *Lonchura leucosticta* | LC | 3 | 0.00 |
| 229 | White-chested Babbler | *Trichastoma rostratum* | NT | 2 | 0.00 |
| 230 | Black-naped Monarch | *Hypothymis azurea* | LC | 2 | 0.00 |
| 231 | Cream-browed White-eye | *Heleia superciliaris* | LC | 2 | 0.00 |
| 232 | Long-tailed Glossy Starling* | *Lamprotornis caudatus* | LC | 2 | 0.00 |
| 233 | Red-vented Bulbul* | *Pycnonotus cafer* | LC | 2 | 0.00 |
| 234 | Yellow-spectacled White-eye | *Heleia wallacei* | LC | 2 | 0.00 |
| 235 | Zebra Waxbill* | *Amandava subflava* | LC | 2 | 0.00 |
| 236 | Spotted Crocias | *Laniellus albonotatus* | NT | 1 | 0.00 |
| 237 | Scaly-breasted Bulbul | *Pycnonotus squamatus* | NT | 1 | 0.00 |
| 238 | Asian Brown Flycatcher | *Muscicapa dauurica* | LC | 1 | 0.00 |
| 239 | Diamond Firetail* | *Stagonopleura guttata* | LC | 1 | 0.00 |
| 240 | Eurasian Jay* | *Garrulus glandarius* | LC | 1 | 0.00 |
| 241 | Fire-tufted Barbet | *Psilopogon pyrolophus* | LC | 1 | 0.00 |
| 242 | Green-fronted White-eye | *Zosterops minor* | LC | 1 | 0.00 |
| 243 | Reichenow's Seedeater* | *Crithagra reichenowi* | LC | 1 | 0.00 |
| 244 | Siberian Rubythroat* | *Calliope calliope* | LC | 1 | 0.00 |
| 245 | Streak-headed White-eye | *Heleia squamiceps* | LC | 1 | 0.00 |
| 246 | Sultan Tit | *Melanochlora sultanea* | LC | 1 | 0.00 |
| 247 | Tahiti Swallow | *Hirundo tahitica* | LC | 1 | 0.00 |
| 248 | Violet-backed Starling* | *Cinnyricinclus leucogaster* | LC | 1 | 0.00 |
| 249 | White-flanked Sunbird | *Aethopyga eximia* | LC | 1 | 0.00 |
| 250 | Yellow-throated Hanging-parrot | *Loriculus pusillus* | NT | 1 | 0.00 |

*Indicates non-native taxa
x Indicates identify in family, genera level or hybrid species, and IUCN status not applicable

## Appendix B. Full list taxa with mean asking prices

| No | Common Name | Scientific Name | Price (USD) | | | |
|---|---|---|---|---|---|---|
| | | | Min | Max | Mean | SD |
| 1 | Lovebirds* | *Agapornis spp.* | 2 | 126 | 23 | 21 |
| 2 | White-rumped Shama | *Kittacincla malabarica* | 17 | 909 | 201 | 131 |
| 3 | Canaries* | *Serinus spp.* | 2 | 206 | 40 | 31 |
| 4 | Oriental Magpie-robin | *Copsychus saularis* | 3 | 210 | 52 | 26 |
| 5 | Zebra Dove | *Geopelia striata* | 2 | 290 | 41 | 41 |
| 6 | Javan Pied Starling | *Gracupica jalla* | 3 | 196 | 49 | 20 |
| 7 | Sunda Collared-dove | *Streptopelia bitorquata* | 2 | 91 | 20 | 14 |
| 8 | Yellow-vented Bulbul | *Pycnonotus goiavier* | 2 | 71 | 17 | 13 |
| 9 | Long-tailed Shrike | *Lanius schach* | 2 | 122 | 29 | 18 |
| 10 | Orange-headed Thrush | *Geokichla citrina* | 2 | 350 | 85 | 57 |
| 11 | Bar-winged Prinia | *Prinia familiaris* | 2 | 87 | 20 | 13 |
| 12 | Eastern Spotted Dove | *Spilopelia chinensis* | 2 | 206 | 36 | 41 |
| 13 | Javan Myna | *Acridotheres javanicus* | 2 | 77 | 16 | 10 |
| 14 | Straw-headed Bulbul | *Pycnonotus zeylanicus* | 77 | 2.797 | 709 | 362 |
| 15 | Chestnut-capped Thrush | *Geokichla interpres* | 13 | 332 | 83 | 49 |
| 16 | Horsfield's Bushlark | *Mirafra javanica* | 8 | 559 | 94 | 99 |
| 17 | Red Siskin* | *Spinus cucullatus* | 2 | 524 | 122 | 77 |
| 18 | Greater Green Leafbird | *Chloropsis sonnerati* | 7 | 301 | 76 | 39 |
| 19 | Black-throated Canary* | *Crithagra atrogularis* | 3 | 350 | 87 | 45 |
| 20 | Black-throated Laughingthrush* | *Garrulax chinensis* | 4 | 944 | 249 | 92 |
| 21 | Brown-cheeked Bulbul | *Alophoixus bres* | 5 | 189 | 41 | 19 |
| 22 | Sooty-headed Bulbul | *Pycnonotus aurigaster* | 2 | 56 | 11 | 7 |

(*continued on next page*)

(continued)

| No | Common Name | Scientific Name | Price (USD) | | | |
|---|---|---|---|---|---|---|
| | | | Min | Max | Mean | SD |
| 23 | Black-throated Prinia | *Prinia atrogularis* | 2 | 98 | 21 | 16 |
| 24 | Black-naped Oriole | *Oriolus chinensis* | 3 | 157 | 39 | 22 |
| 25 | Chinese Hwamei* | *Garrulax canorus* | 26 | 1.189 | 305 | 159 |
| 26 | Common Iora | *Aegithina tiphia* | 2 | 70 | 19 | 13 |
| 27 | Olive-winged Bulbul | *Pycnonotus plumosus* | 2 | 196 | 48 | 22 |
| 28 | Hill Blue-flycatcher | *Cyornis banyumas* | 3 | 182 | 50 | 28 |
| 29 | Starlings | *Sturnus spp.* | 2 | 336 | 71 | 69 |
| 30 | Ashy Tailorbird | *Orthotomus ruficeps* | 2 | 66 | 12 | 7 |
| 31 | Timor Zebra Finch | *Taeniopygia guttata* | 2 | 126 | 28 | 19 |
| 32 | Common Myna | *Acridotheres tristis* | 3 | 122 | 27 | 16 |
| 33 | White-rumped Seedeater* | *Crithagra leucopygia* | 9 | 210 | 58 | 25 |
| 34 | Chestnut-capped Laughingthrush | *Garrulax mitratus* | 7 | 84 | 25 | 11 |
| 35 | Purple-throated Sunbird | *Leptocoma sperata* | 3 | 91 | 23 | 14 |
| 36 | Great Tit | *Parus major* | 2 | 42 | 14 | 7 |
| 37 | Plain Prinia | *Prinia inornata* | 2 | 49 | 13 | 8 |
| 38 | White-rumped Munia | *Lonchura striata* | 2 | 105 | 24 | 18 |
| 39 | Asian Glossy Starling | *Aplonis panayensis* | 2 | 91 | 18 | 12 |
| 40 | Yellow-fronted Canary* | *Crithagra mozambica* | 7 | 210 | 57 | 22 |
| 41 | Orange-bellied Leafbird* | *Chloropsis hardwickii* | 28 | 839 | 217 | 87 |
| 42 | Scarlet-headed Flowerpecker | *Dicaeum trochileum* | 2 | 35 | 8 | 4 |
| 43 | Bare-throated Whistler | *Pachycephala nudigula* | 14 | 315 | 98 | 42 |
| 44 | Fulvous-chested Jungle-flycatcher | *Cyornis olivaceus* | 3 | 119 | 31 | 24 |
| 45 | Pied Bushchat | *Saxicola caprata* | 3 | 122 | 33 | 16 |
| 46 | Common Tailorbird | *Orthotomus sutorius* | 2 | 38 | 9 | 5 |
| 47 | Eurasian Tree Sparrow | *Passer montanus* | 2 | 70 | 20 | 16 |
| 48 | Orange-spotted Bulbul | *Pycnonotus bimaculatus* | 3 | 59 | 14 | 6 |
| 49 | Asian Golden Weaver | *Ploceus hypoxanthus* | 2 | 59 | 15 | 12 |
| 50 | Laughingthrushes* | *Garrulax spp.* | 9 | 490 | 124 | 100 |
| 51 | Gouldian Finch* | *Chloebia gouldiae* | 9 | 385 | 106 | 53 |
| 52 | Brown-throated Sunbird | *Geokichla dohertyi* | 2 | 28 | 7 | 5 |
| 53 | Chestnut-backed Thrush | *Anthreptes malacensis* | 6 | 175 | 44 | 20 |
| 54 | Javan Fulvetta | *Alcippe pyrrhoptera* | 2 | 49 | 12 | 7 |
| 55 | Java Sparrow | *Lonchura oryzivora* | 2 | 56 | 16 | 10 |
| 56 | Asian Fairy-bluebird | *Irena puella* | 9 | 133 | 43 | 19 |
| 57 | Blue-and-white Flycatcher | *Cyanoptila cyanomelana* | 3 | 52 | 24 | 8 |
| 58 | Hooded Pitohui | *Pitohui dichrous* | 31 | 245 | 104 | 45 |
| 59 | Lesser Green Leafbird | *Chloropsis cyanopogon* | 2 | 105 | 27 | 13 |
| 60 | Oriental White-eye | *Zosterops palpebrosus* | 3 | 59 | 17 | 10 |
| 61 | Grosbeak Starling | *Scissirostrum dubium* | 8 | 105 | 26 | 13 |
| 62 | Sunda Laughingthrush | *Garrulax palliatus* | 7 | 140 | 36 | 16 |
| 63 | Blue-masked Leafbird | *Chloropsis venusta* | 6 | 105 | 37 | 14 |
| 64 | Streaked Bulbul | *Ixos malaccensis* | 4 | 59 | 19 | 9 |
| 65 | White-headed Munia | *Lonchura maja* | 2 | 35 | 9 | 7 |
| 66 | Ruby-throated Bulbul | *Pycnonotus dispar* | 2 | 52 | 14 | 10 |
| 67 | Hybrid Eastern Spotted Dove x Sunda Collared-dove | | 3 | 66 | 16 | 10 |
| 68 | Javan Leafbird | *Chloropsis cochinchinensis* | 3 | 94 | 23 | 11 |
| 69 | Hooded Butcherbird | *Cracticus cassicus* | 17 | 420 | 143 | 60 |
| 70 | Crested Jay | *Platylophus galericulatus* | 14 | 420 | 126 | 49 |
| 71 | Oriental Reed-warbler | *Acrocephalus orientalis* | 2 | 105 | 22 | 17 |
| 72 | Hybrid Red Siskin x Island Canary | | 7 | 196 | 72 | 33 |
| 73 | Pale Blue-flycatcher | *Cyornis unicolor* | 3 | 59 | 17 | 9 |
| 74 | Scarlet Minivet | *Pericrocotus flammeus* | 2 | 42 | 15 | 7 |
| 75 | Black-headed Bulbul | *Brachypodius atriceps* | 2 | 49 | 11 | 7 |
| 76 | Hybrid Black-throated Canary x White-rumped Seedeater | | 23 | 182 | 62 | 28 |
| 77 | Javan Grey-throated White-eye | *Heleia javanica* | 2 | 45 | 11 | 7 |
| 78 | Javan Munia | *Lonchura leucogastroides* | 2 | 70 | 14 | 13 |
| 79 | Hybrid Black-throated Canary x Island Canary | | 14 | 182 | 60 | 29 |
| 80 | Black-winged Myna | *Acridotheres melanopterus* | 2 | 245 | 64 | 38 |
| 81 | Racquet-tailed Treepie | *Crypsirina temia* | 5 | 140 | 34 | 25 |
| 82 | Orange-banded Thrush | *Geokichla peronii* | 17 | 210 | 56 | 31 |
| 83 | Blue Whistling-thrush | *Myophonus caeruleus* | 4 | 94 | 27 | 14 |
| 84 | Chestnut-crested Yuhina | *Yuhina everetti* | 2 | 105 | 35 | 13 |
| 85 | Purple-backed Starling | *Agropsar sturninus* | 3 | 59 | 14 | 10 |
| 86 | Javan White-eye | *Zosterops flavus* | 3 | 91 | 21 | 17 |
| 87 | Black-collared Starling* | *Gracupica nigricollis* | 70 | 524 | 208 | 73 |
| 88 | Lesser Shortwing | *Brachypteryx leucophris* | 3 | 59 | 14 | 9 |
| 89 | Drongos | *Dicrurus spp.* | 5 | 105 | 27 | 13 |
| 90 | Velvet-fronted Nuthatch | *Sitta frontalis* | 7 | 59 | 22 | 10 |

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(*continued*)

| No | Common Name | Scientific Name | Price (USD) | | | |
|---|---|---|---|---|---|---|
| | | | Min | Max | Mean | SD |
| 91 | Spot-throated Babbler* | *Pellorneum albiventre* | 9 | 490 | 184 | 95 |
| 92 | White-breasted Woodswallow | *Artamus leucoryn* | 4 | 70 | 20 | 12 |
| 93 | Silver-eared Mesia | *Leiothrix argentauris* | 10 | 315 | 80 | 46 |
| 94 | Red-billed Leiothrix* | *Leiothrix lutea* | 31 | 350 | 119 | 64 |
| 95 | Lesser Racquet-tailed Drongo | *Dicrurus remifer* | 3 | 140 | 41 | 23 |
| 96 | Mangrove Blue-flycatcher | *Cyornis rufigastra* | 10 | 105 | 31 | 17 |
| 97 | Scaly-crowned Honeyeater | *Lichmera lombokia* | 2 | 105 | 22 | 19 |
| 98 | Ashy Drongo | *Dicrurus leucophaeus* | 7 | 70 | 23 | 11 |
| 99 | Red Avadavat | *Amandava amandava* | 2 | 49 | 15 | 7 |
| 100 | Chestnut-capped Babbler | *Timalia pileata* | 2 | 31 | 9 | 5 |
| 101 | House Crow | *Corvus splendens* | 24 | 490 | 123 | 73 |
| 102 | Zitting Cisticola | *Cisticola juncidis* | 2 | 35 | 10 | 7 |
| 103 | Finches* | | 3 | 210 | 55 | 50 |
| 104 | Long-tailed Sibia | *Heterophasia picaoides* | 7 | 115 | 30 | 20 |
| 105 | Mugimaki Flycatcher | *Ficedula mugimaki* | 5 | 38 | 18 | 9 |
| 106 | Hair-crested Drongo | *Dicrurus hottentottus* | 9 | 117 | 38 | 25 |
| 107 | Streaked Weaver | *Ploceus manyar* | 2 | 35 | 15 | 8 |
| 108 | Javan Bulbul | *Ixos virescens* | 3 | 42 | 13 | 8 |
| 109 | Woodpeckers | | 5 | 105 | 25 | 17 |
| 110 | Thick-billed White-eye | *Heleia crassirostris* | 4 | 63 | 19 | 10 |
| 111 | Helmeted Friarbird | *Philemon buceroides* | 17 | 140 | 61 | 31 |
| 112 | Pin-tailed Parrotfinch | *Erythrura prasina* | 2 | 45 | 12 | 8 |
| 113 | Horsfield's Babbler | *Malacocincla sepiaria* | 2 | 31 | 10 | 6 |
| 114 | Indigo Flycatcher | *Eumyias indigo* | 2 | 38 | 14 | 6 |
| 115 | Sulawesi Myna | *Basilornis celebensis* | 3 | 140 | 72 | 29 |
| 116 | Calandra Lark* | *Melanocorypha calandra* | 56 | 350 | 129 | 60 |
| 117 | Blue Nuthatch | *Sitta azurea* | 5 | 56 | 19 | 11 |
| 118 | Common Flameback | *Dinopium javanense* | 4 | 70 | 30 | 13 |
| 119 | Oriental Skylark* | *Alauda gulgula* | 35 | 668 | 185 | 107 |
| 120 | Sunda Pygmy Woodpecker | *Picoides moluccensis* | 5 | 52 | 19 | 11 |
| 121 | Black Drongo | *Dicrurus macrocercus* | 6 | 94 | 28 | 16 |
| 122 | Chestnut-backed Scimitar-babbler | *Pomatorhinus montanus* | 4 | 42 | 15 | 7 |
| 123 | Ruby-cheeked Sunbird | *Chalcoparia singalensis* | 3 | 66 | 23 | 12 |
| 124 | Crested Myna* | *Acridotheres cristatellus* | 23 | 315 | 74 | 56 |
| 125 | Scaly-crowned Babbler | *Malacopteron cinereum* | 4 | 21 | 7 | 2 |
| 126 | Javan Green Magpie | *Cissa thalassina* | 35 | 126 | 71 | 16 |
| 127 | White-bibbed Babbler | *Stachyris thoracica* | 3 | 49 | 14 | 8 |
| 128 | Ashy Bulbul | *Hemixos flavala* | 7 | 45 | 21 | 8 |
| 129 | Mountain Warbler* | *Phylloscopus trivirgatus* | 3 | 26 | 10 | 4 |
| 130 | Orange-bellied Flowerpecker | *Dicaeum trigonostigma* | 2 | 59 | 11 | 12 |
| 131 | Bali Myna | *Leucopsar rothschildi* | 112 | 601 | 248 | 117 |
| 132 | Long-tailed Paradise-whydah* | *Vidua paradisaea* | 42 | 315 | 120 | 60 |
| 133 | Siberian Thrush | *Geokichla sibirica* | 3 | 56 | 19 | 13 |
| 134 | Lemon-breasted Canary* | *Crithagra citrinipectus* | 56 | 301 | 117 | 38 |
| 135 | Yellow-bellied Prinia | *Prinia flaviventris* | 2 | 42 | 10 | 9 |
| 136 | Brown Prinia | *Prinia polychroa* | 3 | 35 | 13 | 7 |
| 137 | Golden Whistler | *Pachycephala pectoralis* | 7 | 56 | 29 | 12 |
| 138 | Sunda Blue Robin | *Myiomela diana* | 7 | 52 | 17 | 8 |
| 139 | Timor Figbird | *Sphecotheres viridis* | 24 | 210 | 120 | 41 |
| 140 | Javan Oriole | *Oriolus cruentus* | 10 | 87 | 39 | 19 |
| 141 | Olive-backed Sunbird | *Cinnyris jugularis* | 2 | 52 | 16 | 15 |
| 142 | White-crested Laughingthrush | *Garrulax leucolophus* | 35 | 350 | 109 | 70 |
| 143 | Black Laughingthrush | *Garrulax lugubris* | 14 | 56 | 27 | 10 |
| 144 | Little Pied Flycatcher | *Ficedula westermanni* | 3 | 42 | 10 | 8 |
| 145 | Golden-bellied Gerygone | *Gerygone sulphurea* | 3 | 42 | 15 | 11 |
| 146 | Oriental Dollarbird | *Eurystomus orientalis* | 9 | 147 | 91 | 34 |
| 147 | Scaly-breasted Munia | *Lonchura punctulata* | 3 | 14 | 8 | 3 |
| 148 | Chestnut Munia* | *Lonchura atricapilla* | 2 | 20 | 9 | 4 |
| 149 | Crested White-eye | *Heleia dohertyi* | 6 | 70 | 18 | 12 |
| 150 | Sunda Pied Fantail | *Rhipidura javanica* | 3 | 45 | 14 | 8 |
| 151 | Fulvous-breasted Woodpecker | *Dendrocopos macei* | 5 | 63 | 16 | 10 |
| 152 | Grey-cheeked Tit-babbler | *Mixornis flavicollis* | 3 | 26 | 8 | 6 |
| 153 | Pied Triller | *Lalage nigra* | 2 | 35 | 9 | 6 |
| 154 | White-breasted Babbler | *Stachyris grammiceps* | 5 | 35 | 15 | 7 |
| 155 | Mangrove Whistler | *Pachycephala cinerea* | 6 | 27 | 21 | 5 |
| 156 | Golden-headed Cisticola | *Cisticola exilis* | 6 | 49 | 31 | 14 |
| 157 | Large Wren-babbler | *Turdinus macrodactylus* | 2 | 42 | 18 | 8 |
| 158 | Little Spiderhunter | *Arachnothera longirostra* | 2 | 24 | 9 | 5 |

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(*continued*)

| No | Common Name | Scientific Name | Price (USD) | | | |
|---|---|---|---|---|---|---|
| | | | Min | Max | Mean | SD |
| 159 | Hybrid Black-throated Canary x Yellow-fronted Seedeater | | 31 | 161 | 69 | 32 |
| 160 | Long-tailed Finch* | *Poephila acuticauda* | 45 | 175 | 109 | 29 |
| 161 | Streaky-breasted Spiderhunter | *Arachnothera affinis* | 3 | 42 | 16 | 11 |
| 162 | Common Hill Myna | *Gracula religiosa* | 52 | 350 | 127 | 69 |
| 163 | Eurasian Skylark* | *Alauda arvensis* | 105 | 594 | 230 | 136 |
| 164 | Superb Starling* | *Lamprotornis superbus* | 91 | 455 | 171 | 85 |
| 165 | Crimson Sunbird | *Aethopyga siparaja* | 5 | 52 | 15 | 10 |
| 166 | Eyebrowed Thrush | *Turdus obscurus* | 10 | 35 | 19 | 6 |
| 167 | Grey-bellied Bulbul | *Pycnonotus cyaniventris* | 2 | 38 | 20 | 9 |
| 168 | Javan Shortwing | *Brachypteryx montana* | 7 | 49 | 19 | 9 |
| 169 | Southern White-necked Myna | *Streptocitta albicollis* | 59 | 294 | 167 | 60 |
| 170 | Yellow-bellied Warbler | *Abroscopus superciliaris* | 2 | 28 | 8 | 6 |
| 171 | Brahminy Starling* | *Sturnia pagodarum* | 24 | 490 | 194 | 127 |
| 172 | Golden Myna | *Mino anais* | 14 | 315 | 124 | 78 |
| 173 | Hybrid White-rumped Seedeater x Yellow-fronted Seedeater | | 17 | 105 | 56 | 21 |
| 174 | Red-breasted Parakeet | *Psittacula alexandri* | 28 | 126 | 61 | 25 |
| 175 | Large Cuckooshrike | *Coracina javensis* | 9 | 42 | 24 | 6 |
| 176 | Bulbuls | *Pycnototus spp.* | 14 | 122 | 59 | 26 |
| 177 | Mountain White-eye | *Zosterops montanus* | 3 | 28 | 13 | 6 |
| 178 | Rufous-tailed Tailorbird | *Orthotomus sericeus* | 3 | 31 | 11 | 6 |
| 179 | Siberian Blue Robin | *Larvivora cyane* | 38 | 98 | 63 | 20 |
| 180 | Yellow-rumped Flycatcher | *Ficedula zanthopygia* | 8 | 21 | 11 | 2 |
| 181 | European Goldfinch* | *Carduelis carduelis* | 86 | 385 | 253 | 109 |
| 182 | Pallas's Grasshopper-warbler | *Locustella certhiola* | 3 | 42 | 18 | 11 |
| 183 | Rosy Starling* | *Pastor roseus* | 42 | 126 | 82 | 34 |
| 184 | Hybrid Rock Dove x Rock Dove | | 12 | 35 | 22 | 6 |
| 185 | Striated Grassbird | *Megalurus palustris* | 5 | 49 | 15 | 9 |
| 186 | Village Indigobird* | *Vidua chalybeata* | 52 | 350 | 138 | 73 |
| 187 | Black-bellied Crimson Finch | *Neochmia phaeton* | 7 | 35 | 26 | 6 |
| 188 | Blue-eared Kingfisher | *Alcedo meninting* | 3 | 35 | 16 | 8 |
| 189 | Mountain Tailorbird | *Phyllergates cucullatus* | 5 | 17 | 13 | 4 |
| 190 | Chestnut-fronted Shrike-babbler | *Pteruthius aenobarbus* | 3 | 28 | 18 | 7 |
| 191 | Crescent-chested Babbler | *Cyanoderma melanothorax* | 2 | 28 | 12 | 9 |
| 192 | Dusky Munia | *Lonchura fuscans* | 31 | 140 | 75 | 28 |
| 193 | Hooded Siskin* | *Spinus magellanicus* | 94 | 559 | 250 | 131 |
| 194 | Bank Myna* | *Acridotheres ginginianus* | 14 | 77 | 36 | 18 |
| 195 | Varied Honeyeater | *Gavicalis versicolor* | 23 | 140 | 85 | 35 |
| 196 | Sumatran Laughingthrush | *Garrulax bicolor* | 24 | 105 | 58 | 22 |
| 197 | Javan Broadbill | *Eurylaimus javanicus* | N/A | N/A | N/A | N/A |
| 198 | Black Mannikin | *Lonchura stygia* | N/A | N/A | N/A | N/A |
| 199 | Black-winged Flycatcher-shrike | *Hemipus hirundinaceus* | N/A | N/A | N/A | N/A |
| 200 | Crimson-breasted Flowerpecker | *Prionochilus percussus* | N/A | N/A | N/A | N/A |
| 201 | Mongolian Lark* | *Melanocorypha mongolica* | N/A | N/A | N/A | N/A |
| 202 | Rufous-browed Babbler | *Pellorneum capistratum* | N/A | N/A | N/A | N/A |
| 203 | Javan Cochoa | *Cochoa azurea* | N/A | N/A | N/A | N/A |
| 204 | Arctic Warbler | *Phylloscopus borealis* | N/A | N/A | N/A | N/A |
| 205 | Blue-capped Cordon-bleu* | *Uraeginthus cyanocephalus* | N/A | N/A | N/A | N/A |
| 206 | Scarlet-breasted Flowerpecker | *Prionochilus thoracicus* | N/A | N/A | N/A | N/A |
| 207 | Grey-crowned Mannikin | *Lonchura nevermanni* | N/A | N/A | N/A | N/A |
| 208 | Hairy-backed Bulbul | *Tricholestes criniger* | N/A | N/A | N/A | N/A |
| 209 | Kingfishers | *Alcedo spp.* | N/A | N/A | N/A | N/A |
| 210 | Lineated Barbet | *Psilopogon lineatus* | N/A | N/A | N/A | N/A |
| 211 | Australian Magpie | *Gymnorhina tibicen* | N/A | N/A | N/A | N/A |
| 212 | Blue-faced Honeyeater | *Entomyzon cyanotis* | N/A | N/A | N/A | N/A |
| 213 | Five-coloured Munia | *Lonchura quinticolor* | N/A | N/A | N/A | N/A |
| 214 | Red-whiskered Bulbul* | *Pycnonotus jocosus* | N/A | N/A | N/A | N/A |
| 215 | Scaly Thrush | *Zoothera dauma* | N/A | N/A | N/A | N/A |
| 216 | Puff-backed Bulbul | *Euptilotus eutilotus* | N/A | N/A | N/A | N/A |
| 217 | Chestnut-cheeked Starling* | *Agropsar philippensis* | N/A | N/A | N/A | N/A |
| 218 | Common Nightingale* | *Luscinia megarhynchos* | N/A | N/A | N/A | N/A |
| 219 | Greater Bird-of-paradise | *Paradisaea apoda* | N/A | N/A | N/A | N/A |
| 220 | Long-tailed Broadbill | *Psarisomus dalhousiae* | N/A | N/A | N/A | N/A |
| 221 | White-eared Bulbul* | *Pycnonotus leucotis* | N/A | N/A | N/A | N/A |
| 222 | Sumatran Cochoa | *Cochoa beccarii* | N/A | N/A | N/A | N/A |
| 223 | Black-and-white Bulbul | *Microtarsus melanoleucos* | N/A | N/A | N/A | N/A |
| 224 | Indian Paradise-flycatcher | *Terpsiphone paradisi* | N/A | N/A | N/A | N/A |
| 225 | Island Thrush | *Turdus poliocephalus* | N/A | N/A | N/A | N/A |
| 226 | Olive-backed Oriole | *Oriolus sagittatus* | N/A | N/A | N/A | N/A |

(*continued on next page*)

(*continued*)

| No | Common Name | Scientific Name | Price (USD) | | | |
|---|---|---|---|---|---|---|
| | | | Min | Max | Mean | SD |
| 227 | White-bellied Canary* | *Crithagra dorsostriata* | N/A | N/A | N/A | N/A |
| 228 | White-spotted Mannikin | *Lonchura leucosticta* | N/A | N/A | N/A | N/A |
| 229 | White-chested Babbler | *Trichastoma rostratum* | N/A | N/A | N/A | N/A |
| 230 | Black-naped Monarch | *Hypothymis azurea* | N/A | N/A | N/A | N/A |
| 231 | Cream-browed White-eye | *Heleia superciliaris* | N/A | N/A | N/A | N/A |
| 232 | Long-tailed Glossy Starling* | *Lamprotornis caudatus* | N/A | N/A | N/A | N/A |
| 233 | Red-vented Bulbul* | *Pycnonotus cafer* | N/A | N/A | N/A | N/A |
| 234 | Yellow-spectacled White-eye | *Heleia wallacei* | N/A | N/A | N/A | N/A |
| 235 | Zebra Waxbill* | *Amandava subflava* | N/A | N/A | N/A | N/A |
| 236 | Spotted Crocias | *Laniellus albonotatus* | N/A | N/A | N/A | N/A |
| 237 | Scaly-breasted Bulbul | *Pycnonotus squamatus* | N/A | N/A | N/A | N/A |
| 238 | Asian Brown Flycatcher | *Muscicapa dauurica* | N/A | N/A | N/A | N/A |
| 239 | Diamond Firetail* | *Stagonopleura guttata* | N/A | N/A | N/A | N/A |
| 240 | Eurasian Jay* | *Garrulus glandarius* | N/A | N/A | N/A | N/A |
| 241 | Fire-tufted Barbet | *Psilopogon pyrolophus* | N/A | N/A | N/A | N/A |
| 242 | Green-fronted White-eye | *Zosterops minor* | N/A | N/A | N/A | N/A |
| 243 | Reichenow's Seedeater* | *Crithagra reichenowi* | N/A | N/A | N/A | N/A |
| 244 | Siberian Rubythroat* | *Calliope calliope* | N/A | N/A | N/A | N/A |
| 245 | Streak-headed White-eye | *Heleia squamiceps* | N/A | N/A | N/A | N/A |
| 246 | Sultan Tit | *Melanochlora sultanea* | N/A | N/A | N/A | N/A |
| 247 | Tahiti Swallow | *Hirundo tahitica* | N/A | N/A | N/A | N/A |
| 248 | Violet-backed Starling* | *Cinnyricinclus leucogaster* | N/A | N/A | N/A | N/A |
| 249 | White-flanked Sunbird | *Aethopyga eximia* | N/A | N/A | N/A | N/A |
| 250 | Yellow-throated Hanging-parrot | *Loriculus pusillus* | N/A | N/A | N/A | N/A |

*Indicates non-native taxa
USD 1 = IDR 14.500

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