Monitoring of Songbird Trades in Jambi, Indonesia

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**Abstract.** Birds keeping, especially songbirds, has been considered as one of the major drivers that lead to species extinction in Indonesia. The demand for songbirds either for songbird’s competition or to be enjoyed at home is considerably high, especially in Java. As the native Javan population has been depleted due to habitat conversion and excessive trapping, the supply of songbirds is provided by other islands in Indonesia such as Sumatera and Kalimantan. We conducted long term monitoring of songbird’s trade on Jambi. Data on bird’s trade was obtained by examining the transaction records from wholesalers from the period of 2016 – 2020. The results showed that there were shifting in species target especially after 2018 due to implementation of new regulation on protected species. However, the total number remains high. The trade comparison for the same period between trade records in 2016 and 2020 demonstrated the reduction in the number of species from around 32 species to 25 species, however, the total volume of traded birds is higher in 2020 which is 20,600 compare to 7,198 during the first sixth months. Considering the pandemic situation, the songbirds trade activities is seemingly not affected especially for the distribution chain from hunter to wholesalers.

1. Introduction

Birds keeping is well known for being firmly tight to Indonesian people's cultural aspect, especially the Javan community. Javanese man is considered as a successful person in life when he can fulfill these five objectives during his life, namely having work, house, horse (equal to the car in modern-day), wife, and birds; thus, representing the balance in life and pride [1,2]. Birds keeping as part of the culture in daily life has been evolving into commercial business since the 1970s due to the introduction to birds singing competition among the owners involving various species from spotted dove to passerine [3, 4].

As birds singing competition increases, many people are getting involved in this business and take significant benefit from various activities such as being hunters, food and cages productions, and a variety of accessories that may improve the performance of birds [5, 6, 7]. Interestingly, birds keeping is not only boosted economic activities and improves livelihood but also expands the biological knowledge on the species that are kept as birds' pets [8].

Songbirds are the most sought-after groups of birds in the market for bird keeping [5]. Songbirds refer to the various species from Order Passeriformes or passerine (perching birds). Although other species from non-passerine may produce good voice or melodious calls, they are not considered songbirds. The market demand for songbirds in Java is very high, especially markets in major cities such as Jakarta and Surabaya [9, 10].
The birds may originate from various places. As the native Javan population has been depleted due to habitat conversion and excessive trapping, the supply of songbirds is provided by other islands in Indonesia such as Sumatera and Kalimantan. Several major cities may provide birds that are not only for the local market but also for Javan markets, i.e., Medan, Pekanbaru, Palembang, and Jambi. Meanwhile, Lampung is regarded more as a hub connecting the sources to Javan traders. During the 2017 surveys, 7,279 birds of 130 species were recorded from those cities in which Medan was the most significant market [11]. Most of the birds were illegally trapped in the forest. The trapping was rife in Aceh, North Sumatera, West Sumatera, and Bengkulu [11-13].

Jambi, as one of the cities surveyed by Chng et al. 2018 showed fewer birds at their market. There was only 22 birds’ stall displaying around 936 birds from 43 species. At the wholesalers’ level, as many as 40 groups of birds (29 species and 11 kinds of birds at family or genus level) comprising 11,660 specimens had been traded, resulting in a total transaction value of Rp 943,957,900,00 [14]. Jambi's trader is seemingly in favor of providing birds for Javan markets instead of selling for domestic demand.

It is undeniable that songbird's business provides many opportunities for people to improve their likelihood. Moreover, songbird's competition has already become a national event, and the demands are expected not to be decreased very soon. The attempt to flooded markets with a higher quality of birds from captivities as a substitute to wild birds is still a long way to go. By looking at this condition, the existence of songbirds in the wild is at stake. Therefore, it is imperative to take critical measurements to slow down and prevent the songbird's crisis in Indonesia.

Songbirds’ conservation efforts need data as a foundation to work efficiently and effectively, and the most crucial data is songbirds' population numbers in the wild. When the population can be determined, adaptive management may be applied to keep the population, supply, and demand check-in balance without endangering the wild population. However, collecting data on the wild population is difficult, and it needs many resources. An alternative method to obtain population data is by conducting a market survey [15-18].

We conduct long-term monitoring in Jambi as this province supply most of its birds for Javan markets using trade data. The monitoring program will provide the data needed for allocating the yearly wild harvest quota of birds. We are also looking for changes in numbers of species, prices, and volumes over the years that indicate wild population dynamics.

2. Material and Methods
We followed bird trade survey and monitoring method using transaction record [14-19]. We acquired transaction records or receipts within the periods of 2016 – 2018 from wholesalers in Jambi. The transactions record contains the following data: species, price, volume, note on dead specimens if available, date, and identity of the supplier if available. The wholesalers always wrote the common name on the receipts. Hence, there was a possibility that one name referred to more than one species or otherwise. Therefore, we identified it as accurately as possible to the species' level by confirming the name with the specimens. We applied genus-group names when it is not possible to identify specimens down to species level. We presented the results descriptively and, when the appropriate, relevant statistical analysis was applied (statistic tools online HTTP:// www.socscistatistics.com).

3. Results and Discussion
We acquired a total of 685 pages of receipts spanning from 2016 - 2020. We recorded 66 types of birds from 24 known families were traded with a total volume of 74,738 individuals. We identified 43 birds to species level from these types of birds, and the others were a mix of genus and family level; and unidentified species. As birds at the genus and family level may consist of two species or more, the total number of species in the trade may reach around 80 species. The records showed that birds with all the IUCN categories and with national protection status were found (table 1).
Table 1. Number of birds’ species, volume and conservation Status (IUCN and Indonesian protection act P.106/2018).

| Species | 2016 | 2017 | 2018 | 2019 | 2020 |
|---------|------|------|------|------|------|
| Volume  | 7.198| 25.891| 21.007| 42 | 20.600|
| EN\(^a\) | 0      | 0      | 1      | 1   | 0    |
| NT\(^a\) | 8      | 11     | 10     | 0   | 5    |
| VU\(^a\) | 1      | 1      | 0       | 0   | 0    |
| LC\(^a\) | 21     | 30     | 29     | 1   | 18   |
| Unknown\(^b\) | 2      | 9      | 4      | 1   | 2    |
| Protected | 7      | 13     | 11     | 0   | 1    |

\(^a\)IUCN status
\(^b\)IUCN status unknown for unidentified species

We employed statistical analysis to see if there were differences in the species numbers and volumes at the first six months over the periods of 2016-2020, excluding 2019 (table 2). The comparison among the total volume traded from 2016 – 2020 showed significant differences (ANOVA, f – ratio 5.58, p-value < 0.05). The number of species seems similar between 2017 and 2018 and become decreases in 2020.

Table 2. Year to year comparison in number of species and trades’ volume for the first six months.

| Year | 2016 | 2017 | 2018 | 2020 |
|------|------|------|------|------|
|      | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Total |
| Months | Volume | Species | Volume | Species | Volume | Species | Volume | Species |
|-------|--------|---------|--------|---------|--------|---------|--------|---------|
| Jan   | 30     | 3       | 2575   | 30     | 5950   | 28      | 1438   | 7       |
| Feb   | 0      | 0       | 1672   | 26     | 5861   | 36      | 5586   | 20      |
| Mar   | 0      | 0       | 1617   | 24     | 5339   | 33      | 4895   | 19      |
| Apr   | 0      | 0       | 2051   | 23     | 3772   | 26      | 899    | 6       |
| May   | 0      | 0       | 1101   | 18     | 76     | 2       | 3743   | 8       |
| Jun   | 66     | 4       | 62     | 7      | 0      | 0       | 4039   | 15      |
| Total | 96     | 6       | 9078   | 40     | 20998  | 44      | 20600  | 25      |

\(\sum X\) \(2\) | Mean \(\sum X\) \(2\) | Std.Dev. | Mean \(\sum X\) \(2\) | Std.Dev. |
|----------------|------------------|----------|------------------|----------|
| 1513           | 3499.6667        | 17463544 | 112492502        | 88364036 |
| N/A            | N/A              | N/A      | N/A              | N/A      |

3.1. Birds Composition

Regarding bird’s composition at the family level, the enormous volume belongs to the family Sturnidae, and it is followed by Zosteropidae, Chloropseidae, Leiothrichidae, Oriolidae, and Columbidae (table 3). The birds’ volume from the rest of the families is below 5000 individuals. Several families are increasing in numbers of individuals over the years, as indicated by the family Sturnidae, Oriolidae, and Muscicapidae. On the other hand, families such as Zosteropidae, Chloropseidae, Leithricidae, and Megalaimidae become less available on the market.
From this data, we can observe changes in birds' supply to the market. Several reasons can explain the indication of shifting species. Firstly, the wild birds are more challenging to harvest. This indication is shown by the family Zosteropidae. Despite the unprotected status for most of its species, the supply tends to decrease as overharvesting may have affected it. The difficulty in providing such species is also indicated by the price, which becomes more expensive in 2020. Secondly, the new protection act released in 2018 has uplifted many species into protected status. All family members Chloropseidae, Psittacidae, and some of the Leiothrichidae, among others, become protected species. Particular documents are required, and population surveys should be conducted before application. Therefore, birds' trades are shifting from protected to unprotected species. Nevertheless, changes in volume for four years of monitoring seem to have little effect on most of the species' price.

3.2. Management Implication

Birds trades monitoring in Jambi demonstrate the importance of transaction data as the wild population surveys are challenging to undertake. Population dynamics in terms of trade volumes can be observed, and it will help the management authority implement adaptive management for sustainable use and conservation. Precaution should be made as the supply of unprotected species is increasing. Trade data should be confirmed with the in-situ population to avoid overharvesting.
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