Fieldwork during pandemic: Backyard bird survey and making student’s biological field practice works

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Abstract. Winarni NL, Anugra BG, Anisafitri S, Kaunain NN, Pradana DH. 2021. Fieldwork during pandemic: Backyard bird survey and making student’s biological field practice works. Biodiversitas 22: 1887-1894. The COVID-19 pandemic situations had forced universities to shutdown face-to-face lectures and change it to online teaching. This change had brought significant challenges to biological courses which need field practice in their syllabus and therefore field practice should be adjusted and innovative. During November-December 2020, we compared students’ field practice from the Ornithology class to urban bird survey to evaluate whether the data collected by students can contribute to citizen science as well as to enhance field practice during online courses. We used point count methods to survey bird communities in urban environment in Jakarta and its satellite cities. We found that the students tended to observe the most abundant birds such as the cave swiftlet and Eurasian tree sparrow and missed unfamiliar species which were smaller-sized birds that use aerial and upper canopy. It was suggested that the data from field practice can also support citizen science when prioritized to common, abundance species. In addition, best practices for field practice were provided, emphasizing the independent field practice incorporating technology in which the results were communicated to the students. Hence, strengthening field practice for biological courses is important to support biodiversity conservation research and activities.

Keywords: Field practice, online courses, urban adapters, urban birds, urban exploiter

INTRODUCTION

The spread of new coronavirus infection COVID-19 worldwide in early 2020 has put a total change in many countries which affected human life and economics, including Indonesia. The COVID-19 has pushed some of the cities in Indonesia to apply partial lockdown. In terms of biodiversity conservation research and teaching, this partial lockdown has greatly affected the implementation of field research and teaching activities. The impact to research can be in the form of postponement of fieldwork, changed research topics to COVID-19 topics, as well as reduced funds to conduct research. Field scientists rely on physical laboratories reduced 30-40% in their research time during pandemic compare to other disciplines (Myers et al. 2020). The situation can be worse for archipelagic countries such as Indonesia which has to put many research activities halted due to the increase of COVID-19 cases around the study area, limited traveling permit across the country or partial lockdown applied at different provinces, or even at districts. As to teaching activities, the university shuts down all face-to-face lectures and move them to online format (Corlett et al. 2020) which brings problems to both lecturers and students such as internet costs, electricity, and even psychological costs (Murawiec and Tryjanowski 2020; Purwanto et al. 2020).

Lockdown in many countries during pandemic COVID-19 may provide positive effects to wildlife and the environment. Air quality in Jakarta showed a decrease in pollutant levels (Pramana et al. 2020). The ‘anthropause’ or the dramatic slowdown in human activity caused by the pandemic has caused an increase in animal activity such as crossing roads or move out at a common time (Stokstad 2020). The less human activity in the urban parks was potential to increase sensitive species (Corlett et al. 2020). In urban areas in California, the reduction of motorcycle traffic, and noise have allowed songbirds to produce higher performance songs to fill up the empty noise space (Derryberry et al. 2020). Birdwatching is non-consumptive leisure activity that can be conducted outdoor (Randler et al. 2020) and the activity is important contribution to citizen science such as adding records of common birds (Winnasis et al. 2018). Not only important to citizen science, but birdwatching had also a positive effect on mental well-being, according to a study by Murawiec and Tryjanowski (2020) in Poland. Therefore, while work time has reduced, the slowdown of activity has brought field researchers and birdwatchers to do birding and bringing citizen science to public engagement (Burgess et al. 2017; Randler et al. 2020). Randler et al. (2020) reported a change in the birding behavior during this pandemic situation to a more localized birding—backyard birding. For example, a 16-year-old birdwatcher in Indonesia virtually invited 182 children aged 6-14 around Jakarta to learn birdwatching in their backyard (Tirtaningtyas 2020).

3/26/2021 1:08:00 PM Adaptation to work and school from home has also increased during lockdown and this is a challenge for several biological courses that still need field
practice (Corlett et al. 2020). Teaching and field practice are moved online and therefore need to be adjusted. During regular courses, field practice is usually conducted by taking students to field sites with lecturer provide direct instructions which are now impossible due to lockdowns. Field practice is crucial in biological fields. The only available option is conducting field practice individually in their own backyards or neighborhood with remote instructions, which may potentially enhance the citizen-science. Tsujimoto (2019) adapted the citizen-science method to involve students in community ecology research and suggested that inexperienced observers can contribute to citizen-science. In ecological studies, citizen-science is commonly used for species occurrence and distribution studies (Bonney et al. 2009; Silvertown 2009; Wei et al. 2016). One of the advantages of citizen-science is to support the lack of data from under-surveyed areas such as private backyard or home gardens (Smith and Hamed 2020). Therefore, in this study, we evaluate how students’ field practice can contribute to citizen-science as well as enhancing field practice during online courses. Specifically, we looked at patterns of birds detected around in urban areas and compare the field survey conducted by formal bird survey and students registered in ornithology class.

**MATERIALS AND METHODS**

**Study area**

We carried out the survey during September-December 2020. There were two sets of data used, the first dataset was the urban bird survey carried out in Depok, a city next to Jakarta involving 4 birdwatchers to collect the data during November-December 2020. The urban bird surveys were focused on three subdistricts in Depok, Indonesia (Beji, Beji Timur, and Kukusan). The other set of data was from students registered in Ornithology class (39 students) which was conducted online during September-December 2020 covering the area where the student lives (Jakarta and West Java-Bekasi, Depok, Bogor) (Figure 1). Some of the birdwatchers were from the same university (Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia) which also joined the Ornithology class. Henceforth, the first dataset was called "student surveys" and the second dataset was called "urban bird surveys". We divided the areas into three habitat types, residential, green spaces, and roadside. Residential was housing complex with or without home gardens. Green spaces were considered as all areas destined for parks, including public and residential parks, cemetery, and fishing areas. Roadside included main roads and small roads with at least one lane for each direction (Jaeger et al. 2005).

![Figure 1. Survey points from 2 datasets. A. Dataset 1 includes an Ornithology class survey around Jakarta, Depok, Bekasi, and Bogor. B. Dataset 2 includes urban bird survey conducted in Depok, West Java](image-url)
Procedures

Bird Surveys

We used point count distance sampling for the bird survey where observers stand on a point and record all the birds heard and seen for 5-10 minutes from 06:00 – 11:00 (Bibby et al. 2000). For the urban bird surveys, observers walked randomly within the three subdistricts in Depok and carried out point counts at different locations. For the student surveys, students were required to submit three observations from different survey points either in their backyard or surrounding areas (green spaces and roadside). Students were equipped with “Checklist Burung Kota”, a pictorial leaflet of Birds Around Us by Burung Indonesia (Burung Indonesia 2013). We use ODK Collect, an open-source Android-based application to collect data (Open Data Kit 2018). The use of this application is to ensure that everybody who joined the survey uses the same form and all data is saved immediately after observation on google drive. The tool also allows observer to record geographical locations of the observations (Nowak et al. 2020). The first and the second dataset used different forms with similar variables.

Data analysis

We assigned species attributes based on their urban tolerance, i.e., urban exploiter and urban adapters (Mardiasutti et al. 2020a), size (small to medium), encounter rate which was calculated based on percentage of (tolerance, small to medium), strata (ground, shrubs, trees, aerial), and detections (species detected by one survey, species detected in both surveys). We used Principal Component Analysis to look at overall patterns of birds detected. Then, we used hierarchical cluster analysis using Euclidean method to compare bird species recorded by student surveys and urban bird surveys to look at differences of birds observed.

RESULTS AND DISCUSSION

Results

In total we recorded 18 species with the student surveys recorded 12 species, while the birdwatcher surveys (urban surveys) recorded 15 species. Total number of points visited by students and birdwatchers were 72 and 115 respectively (Table 1). Because more points conducted in residential areas, obviously there were more species recorded in these areas compare to green spaces and roadside with 17 species in total (Table 1, Table 2). The most common species in both surveys were Cave swiftlet (Collocalia linchi) and Eurasian tree sparrow (Passer montanus). By looking only from overall survey points in residential, the students recorded 83.6% of Eurasian tree sparrow and 39.3% cave swiftlets in residential while the urban survey recorded 61.5% and 84.6% respectively (Figure 2, Table 2).

Table 1. Survey efforts and number of species recorded

| Species                  | Student survey | Urban bird survey |
|--------------------------|----------------|-------------------|
|                          | Residential    | Green spaces     | Residential | Green spaces | Roadside |
| Total species            | 12             | 15               |
| Number of points         | 61             | 7                | 4           | 52           | 19       | 44       |
| Number of species        | 12             | 3                | 4           | 14           | 9        | 10       |

Table 2. Number of bird records from student survey and urban bird survey

| Species                  | English name               | Student survey | Urban survey |
|--------------------------|----------------------------|----------------|--------------|
|                          |                            | Residential    | Green spaces | Roadside     |
|                          |                            | Residential    | Green spaces | Roadside     |
| Apus affinis             | Little swift               | 4              |              |
| Cacomantis merulinus     | Plaintive cuckoo           | 5              |              |
| Chalcoparia singalensis  | Ruby-cheeked sunbird       | 2              |              |
| Collocalia linchi        | Cave swiftlet              | 24             | 7            | 1            | 44       | 18       | 39       |
| Cynnyris jugularis       | Olive-backed sunbird       | 3              | 8            | 1            | 2        |
| Dendrocopos macei        | Fulvous-breasted woodpecker| 1              |              |
| Dicaeum trochileum       | Scarlet-headed flowerpecker| 4              | 3            | 17           | 10       | 19       |
| Hirundo tahitica         | Pacific swallow            | 3              | 18           | 5            | 11       |
| Lanius schach            | Long-tailed strike         | 1              |              |
| Lonchura leucogastroides | Javan munia                | 1              |              |
| Lonchura major           | White-headed munia         | 2              |              |
| Lonchura punctulata      | Scaly-breasted munia       | 2              |              |
| Orthotomus satorius      | Common tailorbird          | 3              |              |
| Passer montanus          | Eurasian tree sparrow      | 51             | 7            | 4            | 32       | 12       | 27       |
| Prinia familiaris        | Bar-winged prinia          | 1              |              |
| Pycnonotus aurigaster    | Sooty-headed bulbul        | 9              | 1            | 31           | 9        | 26       |
| Pycnonotus goiaver       | Yellow-vented bulbul       | 3              | 1            | 16           | 7        | 20       |
| Spilophila chinensis     | Spotted dove               | 5              | 4            | 3            |
In the student survey, other birds than the two most common species were detected at low records (Figure 2). Birds that were recorded in student surveys but not in urban bird surveys include Little swift (Apus affinis), Plaintive cuckoo (Cacomantis meralinus), and Ruby-cheeked sunbird (Chalcoparia singalensis). On the contrary, 6 species were recorded only during urban bird survey, i.e., Fulvous-breasted woodpecker (Dendrocopos macei), Long-tailed shrike (Lanius schach), Javan munia (Lonchura punctulata), Scaly-breasted munia (Lonchura punctulata), White-headed munia (Lonchura maja), and Common tailorbird (Orthotomus sutorius) (Table 2).

In overall, there were 6 urban exploiters, Cave swiftlet (C. linchi), Eurasian tree sparrow (P. montanus), Sooty-headed bulbul (Pycnonotus aurigaster), Scarlet-headed flowerpecker (Dicaeum trochileum), Olive-backed sunbird (Cinnyris jugularis), and Spotted dove (Spilophelia chinensis). The rests were urban adapters. Birds recorded mostly composed of small species (13 species). Based on percentage of encounters, 3 species were common, 5 species were frequent, and the rests were occasional species (10 species) (Table 3).

The PCA analysis suggested that PC1 explains 60.4% of variations, while PC2 explains 17.3% of variations resulting in cumulative proportions of 77.7%. Birds

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**Figure 2.** Number of bird recorded at different habitat types

**Table 3.** Attributes of species recorded during surveys

| Species                   | Urban tolerance | Size    | Encounters | Stratum | Number of observation |
|---------------------------|-----------------|---------|------------|---------|-----------------------|
|                           |                 |         |            |         | Student survey        |
| Apus affinis              | Adapters        | Small   | Frequent   | Aerial  | 10                     |
| Cacomantis meralinus      | Adapters        | Medium  | Occasional | Trees   | 5                      |
| Chalcoparia singalensis   | Adapters        | Small   | Occasional | Trees   | 2                      |
| Collocalia linchi         | Exploiter       | Small   | Common    | Aerial  | 96                     |
| Cinnyris jugularis        | Exploiter       | Small   | Frequent   | Trees   | 3                      |
| Dendrocopos macei         | Adapters        | Small   | Occasional | Trees   | 0                      |
| Dicaeum trochileum        | Exploiter       | Small   | Frequent   | Trees   | 10                     |
| Hirundo tahitica          | Adapters        | Small   | Frequent   | Aerial  | 4                      |
| Lanius schach             | Adapters        | Medium  | Occasional | Shrubs  | 0                      |
| Lonchura leucogastroides  | Adapters        | Small   | Occasional | Shrubs  | 0                      |
| Lonchura maja             | Adapters        | Small   | Occasional | Shrubs  | 0                      |
| Lonchura punctulata       | Adapters        | Small   | Occasional | Shrubs  | 0                      |
| Orthotomus sutorius       | Adapters        | Small   | Occasional | Shrubs  | 0                      |
| Passer montanus           | Exploiter       | small   | Common    | Ground  | 91                     |
| Prinia familiaris         | Adapters        | small   | Occasional | Shrubs  | 1                      |
| Pycnonotus aurigaster     | Exploiter       | medium  | Common    | Trees   | 21                     |
| Pycnonotus goiavier       | Adapters        | medium  | Frequent   | Trees   | 5                      |
| Spilophelia chinensis     | Exploiter       | medium  | Occasional | Ground  | 5                      |
recorded were described by the encounter rates in residence, green spaces, and roadside (PC1), and then by stratum and size in which birds with larger size tend to use lower stratum (PC2) (Table 4, Figure 3).

The dendrogram of the cluster analysis suggested that in the student and urban surveys, two species, the cave swiftlet and the Eurasian tree sparrow were both in one cluster suggesting that the two groups can easily detect the two most common, urban exploiter species. However, the rest of clusters were quite different in the two datasets (Figure 4).

### Table 4. PCA Results

|                | PC1 | PC2 |
|----------------|-----|-----|
| Eigenvalue     | 4.230 | 1.213 |
| % variance     | 60.435 | 17.322 |
| Factor Loadings|     |     |
| Urban tolerance| -0.364 | 0.325 |
| Size           | -0.021 | -0.629 |
| Encounter      | 0.448 | 0.087 |
| Strata         | 0.106 | 0.700 |
| Observations in residential | 0.470 | 0.012 |
| Observations in greenspaces | 0.457 | 0.003 |
| Observations in roadside | 0.474 | -0.031 |

**Figure 3.** Principal Component Analysis with PC1 and PC2

**Figure 4.** Dendrogram from two different surveys

A. Student survey

B. Urban survey
Bias and inconsistency in data collections usually occurred in citizen science particularly due to observer heterogeneity (Burgess et al. 2017; van der Velde et al. 2017; Tsujimoto et al. 2019). One of the challenges in conducting online biological classes was particularly in providing training on field observations due to the lack of interactions. It was hard to standardize observers particularly students who never have experience in birdwatching. Detecting targets are essential in wildlife survey and is common problem in-field training (Supriatna et al. 2020). There was tendency for the students to observe easy-abundant targets such as the Eurasian tree sparrows or cave swiftlet which are common in the urban areas, but less on unfamiliar species which use vegetation. Failure to detect unknown species is common in citizen science projects and care should be taken when interpreting results (Faanes and Bystrak 1981). However, when prioritizing the most common abundant species which are easy to identify, students can also support citizen science projects and contribute to urban research. The fact that urban research in Asia was considered the lowest suggested the importance of citizen science projects, adding data from residential home gardens (Magle et al. 2012). Residential home gardens can be considered as under-surveyed areas with the advantage of not requiring special permission (Smith and Hamed 2020). Involving students in science projects is also giving them their first career experience in research (Tsujimoto et al. 2019).

Field practice during pandemic, a lesson-learned

The pandemic situations created a wide-spread change in teaching and learning processes (Lashley et al. 2020) which particularly affected field-based courses such as ecology, evolution, and conservation biology (Corlett et al. 2020). Almost without preparation, online biological courses during pandemic starting early 2020 have been brought a great challenge to both the lecturers and students. Changing teaching techniques are needed to enhance learning process (Jenkins 2011). Educational online courses are usually embraced both field practice and teaching, therefore should be adaptive, innovative, and consider internet access and costs (Purwanto et al. 2020).

Fieldworks during pandemic should be adjusted with local regulations in social distancing restrictions related to COVID-19. For example, fieldwork should enable less contact among observers and the people in the target areas. When conducted in urban areas, wearing a mask is compulsory. Some best practices for conducting online field practice are as follows:

(i) Create field practice that enable students to work independently. Providing remote instructions and field guides when observing wildlife is necessary and will help students to be able to identify the species correctly. Remote instructions must be clear and concise. There are also online participatory science platforms such as iNaturalist or Burungnesia which is publicly available, can also be used for students to conduct remote field observations (Winnasis et al. 2018; Gerhart et al. 2020; Unger et al. 2020).

(ii) Evaluate technology affordances and apply them during field practice (Kaviani et al. 2020). In this study, we use apps to enable observers to collect data which lecturers can check the results right away. The ODK Collect used in this study provided geographical locations (Open Data Kit 2018) which are useful to map the bird distributions in urban areas, and can be overlaid with forest cover, etc., when needed for subsequent analysis (Anokwa et al. 2009). ODK Collect is particularly available for android users.
which should be taken into account when mobilizing students.

(iii) Always show and discuss the results of the survey to students and get feedback. This would enable students to understand the concept of field observations, the challenge, and difficulties, as well as see the results and making conclusions. Clarification on the data can also be communicated to avoid any misunderstanding in the data collection.

Corlett et al. (2020) suggested that conservation is supposed to go forward and depends on work in the field. He suggested possible examples of research questions to enhance research and conservation such as focusing on impact of pandemic situations to wildlife population and ecosystem. Examples of research questions to education, training, and networking such as impact of pandemic situations on learning outcomes, career impacts and the development of online technology (Corlett et al. 2020). Strengthening field practice for biological courses is therefore essential to support biodiversity conservation research and activities. Although the results might be less than ideal, we must continue to explore the development of field practice associated with biological courses.

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