Diversity and threats to endemic birds in the Wallacean region, Indonesia

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Abstract. Wallacean region, which covers Sulawesi and its satellite islands, Lesser Sunda islands, and Maluku islands, has the richest endemic birds. It contributes 70.1% (366 out of 510) of the total Indonesian endemic bird species. Sulawesi and its satellite islands have the highest number of endemic species (150) followed by the Lesser Sunda Islands (126) and Maluku islands (90). On the other hand, many species in the region are threatened. The number of critically endangered (CR) and endangered (EN) in Sulawesi (7 and 10 species) is higher than Maluku (2 and 4 species) or Lesser Sunda (1 and 6 species). There are two types of threats: direct and indirect threats. Direct threats can be caused by the biological character of the species such as low reproductive rate, long-term parental care; high utilization i.e. hunt (egg, nestling, adult); consumption, trade (pet, hobbies and other uses); and natural predation. Indirect threats include habitat loss, fragmented forest, land conversion, and restricted range because of requiring a very specific habitat type. Although Indonesian wildlife including some endemic birds has been protected by law (P.106/MENLHK/SETJEN/KUM.1/12/2018), illegal trade has been the most important threat. Recent illegal bird trade was recorded from East Java in 2018 and 2019. Confiscated birds were parrots and hornbill from the Wallacean region and Papua, though all of those species are protected.

1. Introduction
Based on the number of bird species, the Indonesian region has been ranked in the fourth richest country after Columbia, Peru, and Brazil. On the other hand, in terms of the number of endemic birds, Indonesia is the richest in the world [1]. The highest number of endemic birds is related to the geographical condition of the region [2] and the high diversity of its ecosystem [3]. Currently, the total number of endemic birds has reached 510 species.

Wallacean region, which covers Sulawesi and its satellite islands, Lesser Sunda Islands and Maluku islands, has the richest endemic birds. It contributes 70.1% (366 out of 510) of the total Indonesian endemic bird species. On the other hand, many species in the region are threatened. Basically, there are two types of threats: direct and indirect threats. Direct threats can be caused by the biological character of the species such as low reproductive rate, long-term parental care; high utilization i.e. hunt (egg, nestling, adult); for consumption, trade (pet, hobbies and other uses); natural predation and disease. Indirect threats include habitat loss, fragmented forest, land conversion, and restricted range because certain species require very specific habitat types.

As an effort to protect Indonesian wildlife including some endemic birds, the Ministry of Environment and Forestry issued regulations named P.106/MENLHK/SETJEN/KUM.1/12/2018 and set up quotas for wildlife trade including bird trade every year in order to implement CITES (Convention on International Trade in Endangered Species of Wild Fauna & Flora). However, illegal...
trade cannot be stopped and has been the most important threat to wild bird especially endemic species. The objectives of this paper are to present the diversity and threatened status of endemic birds, overlook bird quotas and discuss illegal trade of endemic birds from the Wallacean region such as parrots and hornbill.

2. Methods
The study was conducted by reviewing and compiling data from references, unpublished reports, yearly legal quotas data released by the Ministry of Environment & Forestry RI and identification request of bird specimens to the Laboratory of Ornithology, Division of Zoology, Research Centre for Biology-LIPI. Collected data were analyzed qualitatively.

3. Results and Discussion

3.1. Diversity and threatened status of endemic birds
Currently, the number of endemic bird species and genus in Sulawesi and its satellite islands, Lesser Sunda Islands and Maluku islands can be seen in Figure 1. Sulawesi and its satellite islands have the highest number of endemic species (150) followed by the Lesser Sunda Islands (126) and Maluku islands (90). In addition, Sulawesi has 16 endemic genus, Maluku six and Lesser Sunda three genus [4].

![Figure 1. Diversity of endemic birds in Wallacean region](image)

Although the diversity of endemic birds in the Wallacean region is high, the number of threatened species categorized by IUCN is also high. Figure 2 shows that the number of critically endangered species (CR) in Sulawesi (7 species) is higher than Maluku (2 species) or Lesser Sunda (1 species). Also, the number of endangered species (EN) in Sulawesi (10 species) is higher than Maluku (4 species) or Lesser Sunda (6 species).
Figure 2. The threatened status of endemic birds in Wallacea.

Tables 1 and 2 indicate the critically endangered and endangered species. Most of the critically endangered species in Sulawesi are from Sangihe and Talaud islands in the North [5,6], except Corvus unicolor is an endemic of Banggai island in the East of Central Sulawesi [6].

Table 1. Critically endangered (CR) species in Wallacean region

| No. | Sulawesi and Satellite Islands | Lesser Sunda Islands | Maluku Islands |
|-----|--------------------------------|----------------------|----------------|
| 1   | Otus siaoensis                 | Nisaetus floris      | Charmosyna toxopei |
| 2   | Ceyx sangirensis               | Symposiachrus boanensis |
| 3   | Coracornis sanghirensis        |                      |                 |
| 4   | Eutrichomyias rowley           |                      |                 |
| 5   | Corvus unicolor                |                      |                 |
| 6   | Thapsinillas platanea          |                      |                 |
| 7   | Zosterops nehkorni             |                      |                 |

Table 2. Endangered (EN) species in Wallacean region

| No. | Sulawesi and Satellite Islands | Lesser Sunda Islands | Maluku Islands |
|-----|--------------------------------|----------------------|----------------|
| 1   | Macrocephalon maleo            | Ninax sumbaensis     | Scolopax rochusseni |
| 2   | Gymnocrex talaudensis          | Otus alfredi         | Cacatua alba     |
| 3   | Eos histrio                    | Loriculus flosculus  | Lorus domicella |
| 4   | Erythropitta caruleitorques    | Symposiachrus sacerdotum |             |
| 5   | Erythropitta palliceps         | Corvus florensis     | Madanga ruficollis |
| 6   | Symposiachrus everetti         | Gracula venerata     |                 |
| 7   | Cyornis sanfordi               |                      |                 |
| 8   | Ficedula bonthaina             |                      |                 |
| 9   | Hylocitrea bonthaina           |                      |                 |
| 10  | Aethopyga duyvenbodei          |                      |                 |
The primary causes of the decrease of the endemic population in Wallacean region could be habitat destruction and illegal trade. Apart from bird habitat destruction in quality and quantity, bird trade contributes significantly as a serious threat to bird conservation especially for endemic birds [7].

3.2. Bird quotas

Three years (2016, 2018 and 2019) data of bird quotas from the Ministry of Environment & Forestry were reviewed. The data showed that in 2016 and 2019 the quotas for bird species included in CITES Appendix 2 were NIL. In 2018, quotas were given to three species of parrots i.e. *Eos bornea*, *Eos reticulata* and *Trichoglossus haematodus* for 626, 500 and 916 individuals respectively, though those species are protected.

A total of 34 species included in the quotas of CITES Non-Appendix were recorded during three years (Table 2). Two of them, i.e. *Corvus typicus* and *Streptocitta albicollis*, are protected and seven are endemic species: *Enodes erythrophris*, *Eudynamis melanorhyncha*, *Streptocitta albicollis*, *Treron gracilecauda*, *Turacorna manadensis*, *Zosterops atrifrons* and *Zosterops chloris* (Prawiradilaga unpublished data). The number of bird species being given quotas in 2016 was the lowest (7 species), followed by 2018 (21 species) and 2019 is the highest (30 species).

3.3. Illegal trade

In 2018 and 2019 there were two cases of confiscations involving Laboratory of Ornithology LIPI for bird species identification. Both cases occurred in East Java and the confiscated birds were originally from Wallacean region and Papua (Table 5). Ten species were identified and most of them (9 out of 10) are parrots (Psittacidae). All of these species are protected and six species are endemics i.e. *Cacatua moluccensis*, *Cacatua goffiniana*, *Cacatua alba*, *Eos bornea*, *Trichoglossus meyeri* and *Rhyticeros cassidix* (Prawiradilaga unpublished data). Most of the confiscated birds were life individuals. However, in the case of the Knobbed-hornbill (*Rhyticeros cassidix*), they were life individuals and heads of dead birds. The confiscated head of dead Knobbed-d hornbills indicated that illegal hunting hornbill ivory began to threaten endemic birds in Sulawesi. This practice has occurred to the Helmeted hornbill (*Rhinoplax vigil*) in Sumatra and Kalimantan for a long time [8]. Therefore, urgent conservation actions are needed to save the endemic Knobbed-hornbill population in Sulawesi.

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