RESEARCH ARTICLE

Bird Name-a-thon: Categorizing English bird names using crowdsourcing

Erin S. Morrison[1#]*, Guinevere P. Pandolfi[1], Stepfanie M. Aguillon[2], Jarome R. Ali[3], Olivia Archard[1], Daniel T. Baldassarre[4], Illeana Baquero[1], Kevin F.P. Bennett[5], Kevin M. Bonney[1], Riley Bryant[1], Rosanne M. Catanach[6], Therese A. Catanach[7], Ida Chavoshan[1], Sarah N. Davis[8], Brooke D. Goodman[4], Eric R. Gulson-Castillo[9], Matthew Hack[9], Jocelyn Hudon[10], Gavin M. Leighton[11], Kira M. Long[12], Ziqi Ma[1], Dakota E. McCoy[13], J.F. McLaughlin[14], Gaia Rueda Moreno[1], Talia M. Mota[1], Lara Noguchi[1], Ugo Nwigwe[1], Teresa Pegan[9], Kaiya L. Provost[15], Shauna A. Rasband[5], Jessie Frances Salter[16], Lauren C. Silvernail[17], Jared A. Simard[1], Heather R. Skeen[18], Juliana Soto-Patiño[19], Young Ha Suh[20], Qingyue Wang[1], Matthew E. Warshauer[21], Sissy Yan[1], Betsy Zalinski[1], Ziqi Zhao[1], and Allison J. Shultz[20#]

[1]Liberal Studies, New York University, New York, NY, USA

[2]University of California, Los Angeles, Los Angeles, CA, USA

[3]Princeton University, Princeton, NJ, USA

[4]SUNY Oswego, Oswego, NY, USA

[5]University of Maryland, College Park, College Park, MD, USA

[6]Trinity, AL, USA

[7]Academy of Natural Sciences of Drexel University, Philadelphia, PA, USA

[8]Carnegie Museum of Natural History, Pittsburgh, PA, USA

[9]University of Michigan, Ann Arbor, MI, USA

[10]Royal Alberta Museum, Edmonton, Alberta, Canada

[11]SUNY Buffalo State University, Buffalo, NY, USA

[12]University of Idaho, Moscow, ID, USA

[13]University of Chicago, Chicago, IL, USA

[14]University of Alaska Anchorage, Anchorage, AK, USA

[15]Adelphi University, Garden City, NY, USA

[16]Santa Monica College, Santa Monica, CA, USA

[17]Oswego, NY, USA

[18]Negaunee Integrative Research Center, Field Museum of Natural History, Chicago, IL, USA

[19]University of Illinois at Urbana-Champaign, Urbana, IL, USA

[20]Ornithology Department, Natural History Museum of Los Angeles County, Los Angeles, CA, USA

[21]Brooklyn, New York, USA

#These authors contributed equally to the paper.

*Corresponding author: erin.morrison@nyu.edu

Acknowledgements

We thank *Birds of the World* for providing complimentary 1-week subscriptions for the student and amateur participants. We also thank Eden Bayou, Jacob Bijou, Jakiya J. Campbell, Emily Chen, Cindy Cheng, Reema Demopoulos, Savannah Garza, Tamar Hadad, Yujing He, Mia Hejlsberg, Jikke Inia, Yoonseo Jang, Zilai Jin, Risa Kanai, Nick Kruczynski, Langrun Li, Yujia Liu, Queenie Liu, Ziqi Ma, Nyjur Majok, Cecilia Méndez, Kimi Modiri, Yazmin Munoz, Iyioluwa Okediji, Sophia Ordonez, Mohammed Osmanu, Yian Pan, Wend-manegde Pitroipa,

Stephanie Salas, Rylie Shaeffer, Andrew Shafer, Paul Shen, Jesse Sivan, Ciaran Timlin, Bryant To, Alexander Valenzuela-Jones, Frances Vandervoort, Nicholas Walsh, Qingyue Wang, Ruoxi Ye, Yawei Zhang, Guicheng Zhang, Yuchong Zhu, Brian Zou for their contributions to the data collection. Thanks to Emily Webb for providing comments on a draft of the manuscript.

Funding statement

Funding was provided by the NYU Liberal Studies New Faculty Scholarship Award to E.S.M.

Ethics statement

Standard ethics guidelines were followed in the data collection and analysis.

Conflict of interest statement

The authors have no conflict of interest.

Author contributions

E.S.M. and A.J.S. conceived the study idea, supervised the data collection, analyzed the data, and wrote the paper. E.S.M., A.J.S., and G.P.P. developed the methods. S.M.A., D.T.B., K.F.P.B., K.M.B., T.A.C., J.H., G.M.L., J.F.M., K.L.P., L.C.S., H.R.S., J.S.-P. substantially edited the paper. All authors participated in the data collection.

Data Availability

The data, glossary, and gazetteer reported in this article can be accessed at https://github.com/ajshultz/bird_name-a-thon.

ABSTRACT

Common names of species are important for communicating with the general public. In principle, these names should provide an accessible way to engage with and identify species. The official common names of species have historically been labile without standard guidelines, even within a language. Currently, there is no systematic assessment of how often common names communicate identifiable and biologically relevant characteristics about species. This is a particular issue in ornithology, where common names are used more often than scientific names for species of birds in written and spoken English, even by professional researchers. To gain a better understanding of the types of terminology used in the common names of species and their frequency of use, we used a crowdsourcing approach and recruited a total of 85 professional ornithologists and non-professional participants to classify unique descriptors in the English common names of all recognized bird species from around the world. Each species' common name was assigned to one of ten categories associated with aspects of avian biology, ecology, or human culture. Across 10,906 species of birds, 89% had names describing the biology of the species, while the remaining 11% of species had names derived from human cultural references or local non-English languages. Species with common names based on features of avian biology were more likely to share an evolutionary history or be from the same geographic region, in comparison to species with common names derived from human culture. The crowdsourced data collection also revealed that many common names contained specialized or historic terminology unknown to many of the participants. As the first comprehensive assessment of the state of terminology in English common names of birds, the dataset sheds light on historical approaches to nomenclature and provides insight into how the general public currently engages with species through their names.

Keywords: bird names, nomenclature, English common names, taxonomy, crowdsourcing, community science

LAY SUMMARY:

- Common names of birds provide accessible ways to communicate about species to the general public.
- We examined how often different types of terminology are used in the English common names of birds to assess the utility of these names.
- A total of 85 participants from both within and outside of the academic ornithological community classified the common names of 10,906 species of birds into one of ten categories describing properties of avian biology and human culture.
- Across 10,906 species, 89% of names were based on the biology of the species and the remaining 11% had names associated with human culture.
- Species with common names derived from avian biology were more likely to have shared evolutionary history or be located in the same geographical region compared to species with names referencing human culture.
- The results highlight the extent to which properties of avian biology are incorporated into avian nomenclature.

INTRODUCTION

Humans have been observing and classifying living organisms for thousands of years across cultures and languages (Raven et al. 1971). The names of species can have consequences for how they are perceived by people, and this can, in turn, affect how people engage with species

including research and conservation efforts (Karaffa et al. 2012, Ehmke et al. 2018, Gregg et al. 2020, Heard 2023, Heard and Mlynarek 2023). Constructing classification systems that delineate and name organisms is not an exact science, however, as is particularly evident in the different approaches taken to grouping the same organisms (Bailenson et al. 2002, Thiele et al. 2021, Heard 2023). To standardize scientific animal names the International Commission on Zoological Nomenclature (ICZN) has overseen the assignment of a unique universal scientific name for each recognized animal species since 1895. This scientific name is written as a Latin binomial and includes the genus and species names in the Linnaean taxonomy system (Ride et al. 2012). The vernacular names of species, however, are not standardized across languages and have been labile across history, even within a single language or region (McAtee 1953, Kitson 1997, Caramaschi et al. 2005). Known as 'common' or, as argued by Crother (2007), 'standard' names, the use of these vernacular names is seen as a way to communicate about species in a way that is more accessible to a wider audience outside of the scientific community (Link-Pérez et al. 2010, Ehmke et al. 2018, García-de-Lomas et al. 2021). However, even these 'common' names may be unique to a single region, species that span cultures may take on multiple 'common' names in the same language, or the same common name may be unofficially used for multiple species.

In ornithology, in particular, the common names of birds tend to be used more frequently in spoken and written English than their scientific binomial names, even among professionals (Driver and Bond 2021). Despite this, the English common names of birds are only standardized regionally by professional ornithology societies (Schulenberg and Iliff 2014), and there is not a universal set of rules for English common names (Schodde et al. 1978, Ehmke et al. 2018, Chesser et al. 2023, Gill et al. 2023, Remsen et al. 2024). Within the ornithological community,

there is much reflection about what the terminology in standardized English common names should communicate about species (Driver and Bond 2021, Heard 2023, Guedes et al. 2023, Liu et al. 2024, Bird Names For Birds 2020). As part of these deliberations, it is crucial to examine and analyze what the terminology used in English common names currently communicates about species.

While the history of English bird names has been extensively documented (Beolens and Watkins 2004, Jobling 2010, Meiter 2020, Myers 2022), there is, to date, no systematic analysis of the types of terminology used in the English common names of birds. We therefore endeavored to inventory and classify the terms currently used as the specific descriptor in English common names of all avian species into distinct categories associated with avian physical traits, avian natural history, or human culture. Using this dataset, we investigated frequency differences among different categories, and also examined trends in the terminology associated with close taxonomic relationships or with shared biogeography. We predicted that similarities among species due to their biology, life history, or the history of taxonomy in different parts of the world might be reflected in different naming trends across taxonomic groups or geographic regions. The results of this work provide insight into the extent to which English common names of birds are associated with aspects of avian biology and human culture.

Additionally, since one goal of common names is to be accessible to the general public, data collection for this project presented a unique opportunity to involve participants from both within and beyond the academic ornithology community. The inclusion of undergraduate students and amateurs as data collectors was a chance to assess familiarity with the terminology used in English bird names. During data collection, participants were also asked to contribute to a glossary and a gazetteer when they encountered unfamiliar terminology. We make these

resources and the dataset produced from their work available for future analyses on the state of avian nomenclature.

METHODS

Selection of the eBird/Clements Checklist for species names

The English common names used for the study are based on the taxonomy of 10,906 species in the 2022 eBird/Clements Checklist (Clements et al. 2022). At the time of the data collection, there were two additional annually curated global checklists with similar, but not identical, taxonomy to the eBird/Clements Checklist. The International Ornithological Congress (IOC) Checklist 12.2 contained 11,140 species, and 86.9% of these species had the same scientific and common names in the eBird/Clements 2022 Checklist (Gill et al. 2022). The Handbook of Birds of the World (HBW) and BirdLife International Checklist 7.0 contained 11,170 species, and 79.7% of these species had the same scientific and common names in the eBird/Clements 2022 Checklist (Handbook of Birds of the World and BirdLife International 2022). We made the decision to use the 2022 eBird/Clements checklist based on its alignment with the comprehensive *Birds of the World* online database (Billerman et al. 2022), the main reference source for the data collection. The eBird/Clements taxonomy used in *Birds of the World* incorporates the HBW and BirdLife International taxonomy but makes more conservative distinctions between species and subspecies (refer to Birds of the World (2024) and eBird (2024) for more details).

Establishment of categories for species' English names

A majority of species' English common names contain a unique descriptor followed by a group name it shares with closely related species. For example, the unique descriptors in Common Ostrich (*Struthio camelus*) and Somali Ostrich (*Struthio molybdophanes*) are 'Common' and 'Somali', respectively, while the shared group name is 'Ostrich'. This study is only focused on the unique descriptor in a species' English common name, not the shared group name.

Prior to the start of data collection, we ran a series of trial categorizations with a random sample of 30 species drawn from the eBird/Clements 2021 Checklist (Clements et al. 2021). We started with a list of potential categories and three people independently attempted to categorize each of the species names without communicating with each other. Importantly, this group included two professional ornithologists and one undergraduate student without any formal training in ornithology. As a result of this trial, we established via consensus 11 categories for the unique descriptor to encompass aspects of avian physical traits (physical trait in both sexes, male-only physical trait, female-only physical trait, size), avian natural history (geographic location, life history, behavior), and human-constructed terminology independent of the biology of the species in the English language (local language, eponyms, general descriptor, random) (see Supplementary Material Table S1 for detailed descriptions of the categories). After completing the initial categorizations for all 10,906 species into these 11 categories, eight professional ornithologists met and refined the names and descriptions of the categories into a final dataset consisting of 10 categories that align with independent categorizations by Jobling (2010) and Meitner (2020) for both common and scientific bird names (Table 1, Supplementary Material Table S1).

Categorization of species common names

Participants. A total of 85 people participated in the data collection. Of these participants, 56 were pursuing undergraduate degrees (students), 7 had at least an undergraduate degree but no formal training in ornithology (amateurs), and 22 were pursuing graduate degrees or worked in post-graduate careers related to ornithology (professionals). Of the 56 undergraduate students, 50 were enrolled in an introductory biology seminar course for non-science majors at a 4-year degree granting university during the Fall 2022 semester. All participants who categorized at least 100 species as part of the data collection were eligible for authorship credit provided that they agreed to review the manuscript prior to submission for publication. Students in the course were given in-class participation credit for engaging in the data collection during two 75-minute class sessions. This participation grade counted towards 1.6% of their final grade. There was not enough time in class to complete all 100 species for authorship eligibility. Students pursuing authorship eligibility continued to engage in the data collection outside of class and did not receive any additional course credit for this extra work.

Data Collection. Participants were split into two groups (A and B; Supplementary Material Figure S1) and each group evaluated identical lists of 10,906 species. Each species name was therefore independently categorized by two different people. Each participant only worked on one of the two datasets and was not given access to the other dataset. Categorizing the names of species in duplicate provided an opportunity to identify descriptors that were difficult to classify and to identify potential mistakes by participants. Professionals, amateurs, and the six students not enrolled in the introductory biology course were randomly assigned to Dataset A or B based on the order in which they signed up for the project. The introductory biology course consisted of two sections of 25 students each, and each of these sections was assigned to a

different dataset. A total of 39 participants worked on Dataset A (28 students, 2 amateurs, and 9 professionals) and a total of 47 participants worked on Dataset B (29 students, 5 amateurs, and 13 professionals). Participants signed up for 10 species at a time, partitioned by the order they were listed in the 2022 eBird/Clements Checklist. Groups of 10 species had to be categorized in sequential order and participants were not allowed to selectively choose groups to categorize.

Categorization of the unique descriptor in a species' name first started by finding its entry in the *Birds of the World* database and using the provided text, images, and media to determine the category associated with the unique descriptor. If the origin of the unique descriptor could not be determined from *Birds of the World*, participants would then conduct a broader internet search to find other potential sources. Any sources used outside of *Birds of the World* were recorded in the complete dataset. If the origin of the unique descriptor could not be determined based on information in *Birds of the World* or a subsequent Internet search within 10 minutes, participants were asked to note that they could not identify the name within the given time limit and move on to the next species in their list.

To facilitate categorizations for the participants who were not familiar with common terms in ornithology, a glossary was developed for the project that included diagrams of common field markers and definitions of common ornithology descriptors of traits and colors. Participants were granted editing access to the glossary, and were asked to add additional terms and definitions they had to look up during the data collection period. A gazetteer that included descriptions of all geographic locations encountered in species' names was also added to the glossary to help participants, particularly with outdated or obscure terminology. In addition to these resources, participants were provided with two lists of eponyms documented in species' English names compiled by (Beolens and Watkins 2004) and Bird Names For Birds (2020).

Dataset Reconciliation

When the two duplicate datasets were compared, 906 out of the 10,906 species (8.4%) were assigned to different categories in the two datasets (mismatches). There were also 9 additional species that were designated as time limited by data collectors in both datasets. These 915 species were subsequently re-categorized independently in three identical datasets (C, D, E) by 10 professional ornithologists that participated in the first round, each of whom was assigned to one of the three datasets. When the 915 species' re-categorizations were compared across the three datasets, categories for 554 species (60.5%) matched across all 3 datasets and were retained for the final dataset. Categories for 324 (35.4%) of the re-categorized species matched in 2 out of 3 datasets, and the majority category was retained for these species in the final dataset. There was no category agreement across the three datasets for the remaining 37 (4.0%) re-categorized species. The final category for each of these species was jointly assigned by the lead authors of the study, together, based on the references provided by all those who had categorized the species in the first and second round.

Phylogenetic and Geographic Trends

We predicted that similarities in categorization trends exist among species across taxonomic groups or geographic regions. To investigate this prediction, we mapped the general categories assigned to each species' name (i.e., avian physical traits, avian natural history traits, or human-constructed terminology; Table 1) to a time-calibrated maximum clade credibility global avian phylogeny of 10,824 species (McTavish et al. 2024). The taxonomy in this phylogeny is based on the eBird/Clements 2021 checklist. The package *clootl* 0.0.0.900 (Miller and McTavish

2024) in R 4.3 (R Core Team 2023) was used to extract the phylogeny, and the final tree was pruned to only included the 10,775 species with common names that occur in both the 2021 and 2022 checklists (Supplementary Material Figure S4). We measured phylogenetic signals for each of these categories using Fritz & Pervis' *D* for binary traits (presence/absence) (Fritz and Purvis 2010), using the package *caper* 1.0.3 (Orme et al. 2023) in R. *D* calculates the number of sister-clade differences in a binary trait for a given phylogeny (Fritz and Purvis 2010). An estimated *D* close to 1 represents a random distribution of a binary trait among related species on the phylogeny, while an estimated *D* close to 0 represents a clumped distribution of a binary trait among related species that would be expected under the Brownian motion model of evolution (Fritz and Purvis 2010). To test for significance, *D* was estimated for two different trait distributions for each trait that were simulated on the tips of the same phylogeny based on (1) randomly reshuffling the trait values and (2) trait evolution under Brownian motion. Each simulation was repeated 1,000 times.

To identify any geographic trends, we mapped all species names to the IOC World Bird List 13.2 (Gill et al. 2023). We extracted the "general region" for the breeding range of each species, which is generally at the continent level. Species with a breeding range in more than one general region were assigned to each region. We acknowledge the importance of the non-breeding range, but the lack of standardization of non-breeding range information across species precluded our ability to assign species to a general region for non-breeding range. We grouped all oceans together into a single category to increase interpretability, dropped species with a Worldwide distribution (n=10), an Antarctic distribution (n=12; sample size too small for analyses), and 110 species that could not be mapped due to taxonomic differences, for a total of 12,058 species-general region assignments in this dataset. To test whether general regions varied

in the proportions of general descriptor categories (avian physical traits, avian natural history traits, or human-constructed terminology), we conducted a Chi-square test using the chisq.test function in R.

RESULTS

Participation in Data Collection

In Datasets A and B, the 56 students categorized a total of 3,099 species, the 7 amateurs categorized a total of 1,444 species, and the 22 professional ornithologists categorized 17,269 species (Supplementary Material Figure S1A, S1B). Students, amateurs, and professionals all contributed to the 915 species that had to be categorized a second time due to mismatched categorizations between Dataset A and Dataset B or time limits during the initial categorizations (Supplementary Material Figure S1D). We calculated the cumulative rate of mismatches and time limited species within each participant group in each dataset. This was measured by the proportion of species with a mismatched category between the two datasets or time limited, out of the total number of species categorized by members of the participant group in each dataset. The mismatch rate was lowest for professionals (Dataset A: 0.076; Dataset B: 0.073) compared to students (Dataset A: 0.112; Dataset B: 0.131) and amateurs (Dataset A: 0.139; Dataset B: 0.103). At the end of the first round of data collection, 15 of the 56 students, all 7 amateurs, and all 22 professionals categorized at least 100 species across the two datasets and were eligible for authorship credit.

Dataset Comparisons

The majority of the 915 species that were assigned to different categories in Datasets A and B were labeled as a physical trait appearing in both sexes in one dataset and as a male-only physical trait in the other dataset (Supplementary Material Figure S2). This was followed by mismatches in category assignments between geographic location and life history, general descriptor and a physical trait in both sexes, and life history and behavior. As described in Supplementary Material Table S1, prior to the categorizations of these mismatched species in the second round of data collection, 'life history' was renamed 'natural history' to distinguish it more clearly from the 'geographic location' and 'behavior' categories. The 'General Descriptor' and 'Random' categories were also combined into a 'Miscellaneous' category to clarify the difference between a term that described a specific physical feature observed in a species and one that was associated with human culture that was unrelated to a species' biology.

Dataset Description

Of the 10,906 species categorized, 57% were named based on avian physical traits, 32% were named based on avian natural history, and 11% were named based on human-constructed terminology unrelated to the biology of the species (Figure 1; Table 2). Within avian physical traits, most species were named after traits present in both sexes, although nearly 1,000 species were named after traits only found in males, whereas only 20 species were named after traits only found in females (Figure 1; Table 2). Within avian natural history, most species were named after their geographic location compared to other natural history attributes or behavior (Figure 1; Table 2), and in human-constructed terminology, most species were named after people (eponyms), compared to local language or miscellaneous categorizations (Figure 1; Table 2). There was variation across categories for the number of times a term was repeated across

species, with local language having the greatest proportion of distinct terms, and size having the smallest proportion of distinct terms (Table 2).

We next investigated the frequencies of the name descriptors (for this purpose, we considered the first word in the name as the descriptor) across the dataset and across categories. The five most common descriptors in the dataset were “African” (69 times), “Common” (68 times), “Lesser” (65 times), “Great” (65 times), and “Black” (64 times) (Figure 2). We note that after the size-related terms, many of the commonly used physical trait descriptors are related to plumage color (e.g., black, white-browed, spotted) (Supplemental Material Figure S3A). The natural history-related common terms were geography related, especially regarding cardinal directions (e.g., northern, southern) (Supplemental Figure Material Figure S3B). The human-constructed terminology had very few commonly used terms, except for the term “Common” (Supplemental Material Figure S3C).

Phylogenetic and Geographic Trends

All three general categories of species names exhibited weak phylogenetic signal across 10,775 species (Figure 3, Supplementary Material Figure S4, Supplementary Material Table 2). Species names associated with avian physical traits ($D = 0.729$) and avian natural history traits ($D = 0.745$) had stronger phylogenetic signal than names associated with human-constructed terminology ($D = 0.875$). Based on simulation tests of the trait distributions, the phylogenetic signal D of each category differed significantly ($P < 0.001$) from what would be expected under Brownian evolution ($D = 0$), but it also differed significantly ($P < 0.001$) from what would be expected from a random trait distribution on the phylogeny ($D = 1$) for each category.

The proportion of general descriptor categories were significantly different across geographic regions (Figure 4; $\chi^2 = 940.43$, df = 14, $P < 0.0001$). South America and Middle America showed the highest proportions of species named after avian physical traits (0.74 and 0.72, respectively), and Oceans showed the lowest proportion (0.26). Oceans showed the highest proportion of species named after avian natural history (0.58) and Middle America and South America showed the lowest (0.20 and 0.19, respectively). Africa and Oceans showed the highest proportions of species named after human-constructed terminology (both 0.17) and South America showed the lowest (0.06).

DISCUSSION

We assigned the descriptive English names of 10,906 bird species into 10 categories and found that 89% of species are named after some aspect of their biology, whether it be their appearance, ecology, behavior, or geographic location. We established that the most common way to name species is after a physical trait, usually a physical trait that is found in both sexes. We also found a tendency for species that are related to each other or from similar geographic areas to share similar types of descriptors. This effort, which was a successful collaboration among professional ornithologists, amateurs, and students, also led to insights about the nature of term recognition, and the difficulty in some cases of understanding the meaning behind descriptors, including some that many professional ornithologists would have considered to be general knowledge.

One potential explanation for why physical traits are the most frequently applied category in common names is due to centuries of specimen-based taxonomic description. Many species were originally described primarily by scientists working with specimens in collections, be they

in museums or private collections. Further, many bird species' taxonomic boundaries have likely not been revised in a major way since the late 1800s, as the North American avifauna demonstrates (Vaidya et al. 2018). Take, as an illustrative example, the Certhiidae. The 11 species' common names range from physical traits (both sexes), to geographic location, to eponyms. The history of their English names, however, goes back to the mid 1700s (Eurasian Treecreeper, *Certhia familiaris*, (Linnaeus 1758)) up through the late 1800s (Hume's Treecreeper, *Certhia manipurensis*, (Hume 1881)), with the exception of the recently-described Sichuan Treecreeper, *Certhia tianquanensis* (Li 1995). All were either explicitly described from specimens or described by individuals known to work heavily with specimens. Specimens themselves typically only have information about physical traits and size, though well-curated metadata should also reveal geographic location, natural history, and, on occasion, behaviors. Though this example is for only a single family of birds that supports this hypothesis, if the original historical basis of our species taxonomy is specimen-based, then it is sensible that this inertia should impact both modern scientific nomenclature and English nomenclature.

The frequency with which types of physical trait descriptors are used in common names aligns with documented patterns of avian trait diversity. Among species that are named after their physical traits, the majority have common names that describe a trait that occurs in both sexes (Figure 1). This outcome aligns with documented evidence that most bird species do not display any sex differences in plumage brightness and/or pattern (Gonzalez-Voyer et al. 2022). Most common names that do describe sex-specific traits of species, however, refer to traits that only occur in the males, and rarely identify traits unique to the females (Figure 1). One potential reason for this discrepancy is the tendency for humans to focus on more elaborate features that

are more commonly found in males, which has been proposed as one explanation for the biases towards male specimens in museum collections (Cooper et al. 2019).

Another explanation for the bias towards naming species after traits found only in males is that, due to intersexual selection, males tend to have more elaborate and faster evolving traits than females in dichromatic species (Dale et al. 2015, Delhey 2015, Cooney et al. 2019, Gonzalez-Voyer et al. 2022, Nolazco et al. 2022). Males of species in lineages characterized by a large degree of sexual dichromatism may have more unique and prominent traits that can be used as descriptive identifiers compared to females of the same lineage. Female plumage color does vary across species within lineages, but they tend to converge on cryptic colors and patterns that are difficult to distinguish and thus these traits may not be as easy to use for identification markers between species (Price and Eaton 2014, Dale et al. 2015, Shultz and Burns 2017, Delhey et al. 2023). Future work could compare existing data on the degree of sexual dimorphism in species (Owens and Hartley 1998, Dale et al. 2015, Gonzalez-Voyer et al. 2022) to naming patterns. It is likely that species that are named after single-sex traits will be more dimorphic than species that are named after both-sex traits, but it remains to be seen whether this pattern would hold for species named after behaviors or other potentially less sex-specific aspects of biology.

We found that avian-centered name categories have stronger phylogenetic signals than human-constructed name categories. This mirrors the fact that the traits that are used to name species often have phylogenetic signals involving differences in color (Stoddard and Prum 2008, Shultz and Burns 2013, Marcondes and Brumfield 2019, Merwin et al. 2020), song (Freeman et al. 2017, Mason et al. 2017, Demery et al. 2021), and ecology (Phillimore et al. 2006, Hawkins et al. 2007, Cooney et al. 2019). Anecdotally, participants noticed that closely-related species had

similar naming schemes, particularly in speciose groups found in the Neotropics. For example, in the 45 species of *Grallaria* antpittas, 22 and 18 species are named after physical traits or geographic locations, respectively. This is also demonstrated by geographic trends, which showed that the large majority of species in Middle and South American geographic regions were named after physical traits. Conversely, oceanic species are most commonly named after their natural history (primarily geographic location), likely reflecting that many ocean species are difficult to tell apart by plumage or other morphological traits, but live in different geographic areas. We anticipate that further work identifying trends in the specific name descriptors used or common group names might find very different patterns, as there are different goals for the components of a name (i.e., to tell species apart or to identify groups of species). Similarly, future work could more specifically analyze different geographic trends in specific common names and the influence of human history and values on these patterns.

Including non-professionals in the data collection was a way to provide both students and amateurs the chance to learn more about ornithology and, for the students in particular, to gain experience working on a research project alongside professional ornithologists. There is a wide gap between the general public's knowledge of species identification in birds and that of professionals, even for local species (Hooykaas et al. 2019), and there is also evidence that this knowledge has declined over time in school children (Gerl et al. 2021). When people have the chance to learn about species, however, their interest in and connection to nature and biodiversity increases (Cox and Gaston 2015, Hooykaas et al. 2019). Working on this project exposed each of the students and amateurs to a diverse range of bird species that they did not get to select themselves and required them, in most cases, to learn about the biology of a species to make a category assignment. Furthermore, participating in community science projects, such as this one,

are important opportunities for non-professionals to gain scientific literacy and have also been demonstrated to increase participants' interest and engagement in science (Oberhauser and LeBuhn 2012, Bonney et al. 2016, Ruiz-Mallén et al. 2016).

Although professional ornithologists categorized a majority of the species in both datasets, the non-professionals involved in the data collection made meaningful contributions to the project (Supplementary Material Figure S1B). Almost all of the students and amateurs who were eligible for authorship stopped participating in the data collection once they met the minimum threshold of 100 species for authorship credit, whereas most professionals continued to work on the project until all species were categorized (Supplementary Material Figure S1C). The number of species required for authorship credit was purposefully set low to encourage the participation of non-professionals, who may not have had the same interest or time availability as professional ornithologists. In the two class sessions provided for the data collection, for example, there was not enough time for students to categorize 100 species in the allotted time. Students motivated to pursue authorship credit thus had to spend time outside of class working on the dataset, which did not contribute in any way to their grade in the class. Despite these limitations, it was encouraging to see that all seven amateurs and 15 of the 56 students who participated in the data collection were engaged enough to categorize the necessary number of species to become eligible for authorship.

The non-professionals involved in the data collection also provided an important perspective into the accessibility of common names. While mismatched categorizations did occur more frequently among both amateurs and students compared to the professionals, expertise in ornithology did not exempt the professionals from contributing to mismatched category assignments for species (Supplementary Material Figure S1D). Most of these mismatches arose

because, in some cases, it was difficult to distinguish whether a physical trait occurred in both sexes of a species or only in males (Supplementary Material Figure S2). In the Maroon Pigeon (*Columba thomensis*), for example, parts of the male's plumage are described in *Birds of the World* as "rich maroon", while female coloration is described as "duller… with only hints of maroon", and this distinction is difficult to make out in the provided images (Baptista et al. 2020). For issues such as this, we were faced with deciding the extent that a trait has to occur in both sexes for it to be assigned to that category, and much of this was up to personal interpretation. The resolution to independently categorize the mismatched species again in triplicate was an opportunity for consensus agreement in most species, but disagreements across all three datasets still remained for some species' names. These issues highlight the lack of specificity that is inherent in many of the trait descriptors used in common names.

Another issue that likely contributed to category mismatches was the use of historical and specialized English terminology in species names. Diagrams of the names and locations of parts of the bird were provided to all data collectors at the start of the project, but it was the terminology used to describe colors and patterns that proved to be one of the biggest issues. These types of descriptors comprise a majority of the words in the glossary that all participants were asked to contribute to when they encountered an unknown term. Similarly, the gazetteer was started during the first round of data collection when both professional and non-professional participants struggled to find information on outdated or rarely used names for geographic locations. This brings up a question of how useful specialized terms for color, pattern, and geographic location are in English common names, even if they are very specific descriptors, if many people do not know what they mean without further research.

The scope of this project represents a comprehensive starting point for a quantitative examination of the types of terminology used in the common names of birds. We acknowledge that the methodology we developed still limits the conclusions we can make from these data. First, the terminology categories (Supplementary Material Table S1) are inherently biased by the goals for this study. The categories were intentionally designed to broadly capture distinct themes in the terminology used for English common names, with a particular focus on comparing how often terminology is associated with different properties of avian biology or human culture. There are other ways to investigate the meaning of common names using different types of categories or the inclusion of more specific subcategories, and this presents opportunities for future research projects. For example, Burrowing Owls (*Athene cunicularia*) and Barking Owls (*Ninox connivens*) are both named after behaviors, but the former describes nesting habits and the latter describes vocalizations. Likewise, Golden-crowned Sparrows (*Zonotrichia atricapilla*) and White-throated Sparrows (*Zonotrichia albicollis*) are both named after physical traits (both sexes), specifically color, but the colors themselves and body parts are different. Striped Sparrows (*Oriturus superciliosus*), on the other hand, are named after a pattern which does not appear to be specific to any given body part. The question thus remains – what types of natural history, behaviors, or traits are the birds named after?

The results are also constrained by the decision to use the eBird/Clements Checklist (Clements et al. 2022). At the time of the data collection, there were two additional digitally accessible global checklists, one curated by the IOC (Gill et al. 2022) and the other by HBW and BirdLife International (Handbook of Birds of the World and BirdLife International 2022). A consequence of this decision is the exclusion of alternative English common names associated with the same species, either through local names or alternative names in different checklists. For

example, the species officially known as the Jamaican Spindalis (*Spindalis nigricephala*) in the eBird/Clements 2022 Checklist has several local Jamaican names, including Mark Head, Cashew Bird, Silver Head, Spanish Quail, and Champa Beeza (Raffaele et al. 1998). Similarly, the English common name of the species *Anisognathus melanogenys* in the eBird/Clements 2022 Checklist is the Black-cheeked Mountain Tanager and describes a physical trait in both sexes. Its common name in the IOC 13.1 and HBW and Birdlife International 7.0 checklists, however, is the Santa Marta Mountain Tanager, which refers to a geographic location. Future work could compare the categorizations of species' officially recognized English names to local, or alternative, English names on a regional scale.

Lastly, the data are currently limited to the categorizations of common names of birds in American (U.S.) English, which is the standard language of the eBird/Clements checklist (eBird 2024). Historically, European and, later, American naturalists played outsized roles in the development of modern taxonomy that occurred alongside the expansion of Western imperialism around the world (Raven et al. 1971, Driver and Bond 2021). The results presented here therefore mostly capture the philosophy of Western science in species nomenclature. While it is beyond the scope of this project, an interesting next step would be to repeat the same methodology for common names in different languages or amongst different taxonomic groups. Comparing the frequency of different types of descriptors used for the same species names across multiple languages would provide valuable insight into how approaches to avian nomenclature and the philosophy surrounding it vary across cultures and regions. For example, some species might have many names in other languages in culturally diverse regions (Sicard-Ayala et al. 2019).

This project demonstrates that while common names of birds serve many purposes in English, there is a strong emphasis on descriptive characteristics associated with avian biology. We also highlight gaps in naming conventions, particularly for descriptors that are not associated with all individuals in a population or include specialized English terminology. The English language is constantly evolving at regional and global scales (Galloway and Rose 2015, McWhorter 2016), which affects the utility of terms in common names. Even the way colors are categorized and described, for example, can vary among people (Lindsey and Brown 2014). Future work should thus address the extent to which common names represent how people interact with birds today compared with historical interactions and consider differences among cultures.

Supplementary Material:

Supplementary material is available at *Ornithology* online.

LITERATURE CITED

Bird Names For Birds (2020). https://birdnamesforbirds.wordpress.com/.

Bailenson, J. N., M. S. Shum, S. Atran, D. L. Medin, and J. D. Coley (2002). A bird's eye view: Biological categorization and reasoning within and across cultures. *Cognition* 84:1–53.

Baptista, L. F., P. W. Trail, H. M. Horblit, P. F. D. Boesman, and E. F. J. Garcia (2020). Maroon Pigeon (*Columba thomensis*), version 1.0. In *Birds of the World* (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.marpig1.01

Beolens, B., and M. Watkins (2004). *Whose Bird?: Common Bird Names and the People They*

Commemorate. Yale University Press.

Billerman, S. M., B. K. Keeney, P. G. Rodewald, and T. S. Schulenberg (Editors) (2022). *Birds of the World*. Cornell Laboratory of Ornithology, Ithaca, NY, USA. https://birdsoftheworld.org/bow/home

Birds of the World (2024). *Taxonomy*. Cornell Lab of Ornithology. https://birdsoftheworld.org/bow/content/taxonomy.

Bonney, R., T. B. Phillips, H. L. Ballard, and J. W. Enck (2016). Can citizen science enhance public understanding of science? *Public Understanding of Science* 25:2–16.

Caramaschi, U., R. O. De Sá, and W. R. Heyer (2005). Common names for the frog genus Leptodactylus (Amphibia, Anura, Leptodactylidae). *Herpetological Review* 36:119–120.

Chesser, R. T., S. M. Billerman, K. J. Burns, C. Cicero, J. L. Dunn, B. E. Hernández-Baños, R. A. Jiménez, A. W. Kratter, N. A. Mason, P. C. Rasmussen, J. V. Remsen Jr., and K. Winker (2023). *Check-list of North American Birds*. American Ornithological Society. https://checklist.americanornithology.org/taxa/.

Clements, J. F., T. S. Schulenberg, M. J. Iliff, T. A. Federicks, J. A. Gerbracht, D. Lepage, S. M. Billerman, B. L. Sullivan, and C. L. Wood (2021). *The eBird/Clements Checklist of Birds of the World: v2021*. Cornell Laboratory of Ornithology, Ithaca, NY, USA. https://www.birds.cornell.edu/clementschecklist/updateindex/august-2021/.

Clements, J. F., T. S. Schulenberg, M. J. Iliff, T. A. Federicks, J. A. Gerbracht, D. Lepage, S. M. Billerman, B. L. Sullivan, and C. L. Wood (2022). *The eBird/Clements Checklist of Birds of the World: v2022.* Cornell Laboratory of Ornithology, Ithaca, NY, USA. https://www.birds.cornell.edu/clementschecklist/updateindex/october-2022/.

Cooney, C. R., Z. K. Varley, L. O. Nouri, C. J. A. Moody, M. D. Jardine, and G. H. Thomas

(2019). Sexual selection predicts the rate and direction of colour divergence in a large avian radiation. *Nature Communications* 10:1773.

Cooper, N., A. L. Bond, J. L. Davis, R. Portela Miguez, L. Tomsett, and K. M. Helgen (2019). Sex biases in bird and mammal natural history collections. *Proceedings of the Royal Society B: Biological Sciences* 286:20192025.

Cox, D. T. C., and K. J. Gaston (2015). Likeability of garden birds: Importance of species knowledge & richness in connecting people to nature. *PLOS ONE* 10:e0141505.

Crother, B. I. (2007). Standard language (insert language of choice) names versus common names. *Herpetological Review* 38:143.

Dale, J., C. J. Dey, K. Delhey, B. Kempenaers, and M. Valcu (2015). The effects of life history and sexual selection on male and female plumage colouration. *Nature* 527:367–370.

Delhey, K. (2015). The colour of an avifauna: A quantitative analysis of the colour of Australian birds. *Scientific Reports* 5:18514.

Delhey, K., M. Valcu, C. Muck, J. Dale, and B. Kempenaers (2023). Evolutionary predictors of the specific colors of birds. *Proceedings of the National Academy of Sciences of the United States of America* 120:e2217692120.

Demery, A.-J. C., K. J. Burns, and N. A. Mason (2021). Bill size, bill shape, and body size constrain bird song evolution on a macroevolutionary scale. *Ornithology* 138:ukab011.

Driver, R. J., and A. L. Bond (2021). Towards redressing inaccurate, offensive and inappropriate common bird names. *Ibis* 163:1492–1499.

eBird (2024). *Bird Names in eBird*. Cornell Laboratory of Ornithology, Ithaca, NY, USA. https://support.ebird.org/en/support/solutions/articles/48000804865-bird-names-in-ebird.

Ehmke, G., J. A. Fitzsimons, and S. T. Garnett (2018). Standardising English names for

Australian bird subspecies as a conservation tool. *Bird Conservation International* 28:73–85.

Freeman, B. G., G. A. Montgomery, and D. Schluter (2017). Evolution and plasticity: Divergence of song discrimination is faster in birds with innate song than in song learners in Neotropical passerine birds. *Evolution* 71:2230–2242.

Fritz, S. A., and A. Purvis (2010). Selectivity in mammalian extinction risk and threat types: A new measure of phylogenetic signal strength in binary traits. *Conservation Biology* 24:1042–1051.

Galloway, N., and H. Rose (2015). The "New" Englishes. In *Introducing Global Englishes*. Taylor & Francis Group, Oxford, UK, pp. 95–123.

García-de-Lomas, J., M. Clavero, C. M. García, D. Alba, J. M. Torres, A. Jurado, V. Cantero, R. Navarro, and F. Hortas (2021). From *Linderiella baetica* to gambilusa: Involving children in conservation by giving a new species a common name. *Aquatic Conservation: Marine and Freshwater Ecosystems* 31:1543–1547.

Gerl, T., C. Randler, and B. Jana Neuhaus (2021). Vertebrate species knowledge: an important skill is threatened by extinction. *International Journal of Science Education* 43:928–948.

Gill, F., D. Donsker, and P. Rasmussen (2022). *English Names: Principles*. IOC World Bird List. https://www.worldbirdnames.org/new/english-names/principles/.

Gill, F., D. Donsker, and P. Rasmussen (2023). *Master Lists*. IOC World Bird List. https://www.worldbirdnames.org/new/ioc-lists/master-list-2/.

Gonzalez-Voyer, A., G. H. Thomas, A. Liker, O. Krüger, J. Komdeur, and T. Székely (2022). Sex roles in birds: Phylogenetic analyses of the influence of climate, life histories and social environment. *Ecology Letters* 25:647–660.

Gregg, E. A., S. A. Bekessy, J. K. Martin, and G. E. Garrard (2020). Many IUCN red list species have names that evoke negative emotions. *Human Dimensions of Wildlife* 25:468–477.

Guedes, P., F. Alves-Martins, J. M. Arribas, S. Chatterjee, A. M. C. Santos, A. Lewin, L. Bako, P. W. Webala, R. A. Correia, R. Rocha, and R. J. Ladle (2023). Eponyms have no place in 21st-century biological nomenclature. *Nature Ecology & Evolution* 7:1157–1160.

Hawkins, B. A., J. A. F. Diniz-Filho, C. A. Jaramillo, and S. A. Soeller (2007). Climate, niche conservatism, and the global bird diversity gradient. *The American Naturalist* 170:S16–S27.

Handbook of Birds of the World and BirdLife International (2022). *Digital Checklist of the Birds of the World Version 7.0*. https://datazone.birdlife.org/species/taxonomy

Heard, S. B. (2023). The Name of the Rose (and Everything Else): How Codes and Practices in Naming Biological Species Reflect Cultural Identities. In *Names, Naming, and the Law* (I. M. Nick, Editor). Routledge, New York, NY, USA.

Heard, S. B., and J. J. Mlynarek (2023). Naming the menagerie: Creativity, culture and consequences in the formation of scientific names. *Proceedings of the Royal Society B: Biological Sciences* 290:20231970.

Hooykaas, M. J. D., M. Schilthuizen, C. Aten, E. M. Hemelaar, C. J. Albers, and I. Smeets (2019). Identification skills in biodiversity professionals and laypeople: A gap in species literacy. *Biological Conservation* 238:108202.

Hume, A. O. (1881). Novelties? Stray Feathers. *Journal of Ornithology for India and Its Dependencies* 10:150–155.

Jobling, J. A. (2010). *The Helm Dictionary of Scientific Bird Names: From Aalge to Zusii*. Christopher Helm, London, UK.

Karaffa, P. T., M. M. Draheim, and E. C. M. Parsons (2012). What's in a name? Do species' names impact student support for conservation? *Human Dimensions of Wildlife* 17:308–310.

Kitson, P. R. (1997). Old English bird-names. *English Studies* 78:481–505.

Li, G.-Y. (1995). A new subspecies of *Certhia familiaris* (Passeriformes: Certhiidae). *Acta Zootaxonomica Sinica* 20:373–377.

Lindsey, D. T., and A. M. Brown (2014). The color lexicon of American English. *Journal of Vision* 14:17.

Link-Pérez, M. A., V. H. Dollo, K. M. Weber, and E. E. Schussler (2010). What's in a name: Differential labelling of plant and animal photographs in two nationally syndicated elementary science textbook series. *International Journal of Science Education* 32:1227–1242.

Linnaeus, C. (1758). Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. 10th edition. *Holmiae: Impensis Direct*. Laurentii Salvii, Stockholm, Sweden.

Liu, I. A., E. R. Gulson-Castillo, J. X. Wu, A.-J. C. Demery, N. Cortes-Rodriguez, K. M. Covino, S. B. Lerman, S. A. Gill, and V. Ruiz Gutierrez (2024). Building bridges in the conversation on eponymous common names of North American birds. *Ibis* 166:1092-1102.

Marcondes, R. S., and R. T. Brumfield (2019). Fifty shades of brown: Macroevolution of plumage brightness in the Furnariida, a large clade of drab Neotropical passerines. *Evolution* 73:704–719.

Mason, N. A., K. J. Burns, J. A. Tobias, S. Claramunt, N. Seddon, and E. P. Derryberry (2017).

Song evolution, speciation, and vocal learning in passerine birds. *Evolution* 71:786–796.

McAtee, W. L. (1953). Longevity of Bird Names. *NAMES: A Journal of Onomastics* 1:85–102.

McTavish, E. J., J. A. Gerbracht, M. T. Holder, M. J. Iliff, D. Lepage, P. Rasmussen, B. Redelings, L. L. S. Reyes, and E. T. Miller (2024). A complete and dynamic tree of birds. *bioRxiv* 2024.05.20.595017. https://doi.org/10.1101/2024.05.20.595017

McWhorter, J. H. (2016). *Words on the Move: Why English Won't- and Can't- Sit Still (Like, Literally)*. Henry Holt and Co., New York, NY, USA.

Meiter, G. H. (2020). *Bird is the Word: An Historical Perspective on the Names of North American Birds*. The McDonald & Woodward Publishing Company, Newark, Ohio, USA.

Merwin, J. T., G. F. Seeholzer, and B. T. Smith (2020). Macroevolutionary bursts and constraints generate a rainbow in a clade of tropical birds. *BMC Evolutionary Biology* 20:32.

Miller, E., and E. J. McTavish (2024). *clootl*. https://github.com/eliotmiller/clootl/tree/master.

Myers, S. (2022). *The Bird Name Book: A History of English Bird Names*. Princeton University Press, Princeton, NJ, USA.

Nolazco, S., K. Delhey, S. Nakagawa, and A. Peters (2022). Ornaments are equally informative in male and female birds. *Nature Communications* 13:5917.

Oberhauser, K., and G. LeBuhn (2012). Insects and plants: engaging undergraduates in authentic research through citizen science. *Frontiers in Ecology and the Environment* 10:318–320.

Orme, D., R. Freckleton, G. Thomas, T. Petzoldt, S. Fritz, N. Isaac, and W. Pearse (2023). *caper: Comparative analyses of phylogenetics and evolution in R*. https://cran.r-project.org/web/packages/caper/index.html.

Owens, I. P. F., and I. R. Hartley (1998). Sexual dimorphism in birds: why are there so many

different forms of dimorphism? *Proceedings of the Royal Society of London. Series B: Biological Sciences* 265:397–407.

Phillimore, A. B., R. P. Freckleton, C. D. L. Orme, and I. P. F. Owens (2006). Ecology predicts large-scale patterns of phylogenetic diversification in birds. *The American Naturalist* 168:220–229.

Price, J. J., and M. D. Eaton (2014). Reconstructing the evolution of sexual dichromatism: Current color diversity does not reflect past rates of male and female change. *Evolution* 68:2026–2037.

R Core Team (2023). *R: A language and environment for statistical computing*. https://www.r-project.org/.

Raffaele, H., J. Wiley, O. Garrido, A. Keith, and J. Raffaele (1998). *A Guide to the Birds of the West Indies*. Princeton University Press, Princeton, NJ, USA.

Raven, P. H., B. Berlin, and D. E. Breedlove (1971). The origins of taxonomy. *Science* 174:1210–1213.

Remsen, J. V., Jr., J. I. Areta, E. Bonaccorso, S. Claramunt, G. Del-Rio, A. Jaramillo, D. F. Lane, M. B. Robbins, F. G. Stiles, and K. J. Zimmer (2024). *A classification of the bird species of South America*. Museum of Natural Science, Louisiana State University, Baton Rouge, LA, USA. https://www.museum.lsu.edu/~Remsen/SACCBaseline.htm.

Ride, W. D. L., H. G. Cogger, C. Dupuis, O. Kraus, A. Minelli, F. C. Thompson, and P. K. Tubbs (2012). *International Code of Zoological Nomenclature*. https://www.iczn.org/the-code/the-code-online/.

Ruiz-Mallén, I., L. Riboli-Sasco, C. Ribrault, M. Heras, D. Laguna, and L. Perié (2016). Citizen science: Toward transformative learning. *Science Communication* 38:523–534.

Schodde, R., B. Glover, F. C. Kinsky, S. Marchant, A. R. McGill, and S. A. Parher (1978). Recommended English names for Australian birds. *Emu - Austral Ornithology* 77:245–307.

Schulenberg, T. S., and M. J. Iliff (2014). *Methods: Updating the eBird/Clements Checklist 6th Edition*. Cornell Laboratory of Ornithology, Ithaca, NY, USA. https://www.birds.cornell.edu/clementschecklist/about/methods/.

Shultz, A. J., and K. J. Burns (2013). Plumage evolution in relation to light environment in a novel clade of Neotropical tanagers. *Molecular Phylogenetics and Evolution* 66:112–125.

Shultz, A. J., and K. J. Burns (2017). The role of sexual and natural selection in shaping patterns of sexual dichromatism in the largest family of songbirds (Aves: Thraupidae). *Evolution* 71:1061–1074.

Sicard-Ayala, A. M., L. Jaramillo-Mejía, and F. Ayerbe-Quiñones (2019). Un ave, muchos nombres: un pluriverso. *Ornitología Colombiana* 17:eC01.

Stoddard, M. C., and R. O. Prum (2008). Evolution of avian plumage color in a tetrahedral color space: A phylogenetic analysis of new world buntings. *The American Naturalist* 171:755–776.

Thiele, K. R., S. Conix, R. L. Pyle, S. K. Barik, L. Christidis, M. J. Costello, P. P. van Dijk, P. Kirk, A. Lien, S. A. Thomson, F. E. Zachos, et al. (2021). Towards a global list of accepted species I. Why taxonomists sometimes disagree, and why this matters. *Organisms Diversity & Evolution* 21:615–622.

Vaidya, G., D. Lepage, and R. Guralnick (2018). The tempo and mode of the taxonomic correction process: How taxonomists have corrected and recorrected North American bird species over the last 127 years. *PLOS ONE* 13:e0195736.

Table 1. Categories used to group unique descriptors in English common names of bird species. See Supplementary Materials Table 1 for more detailed descriptions of each category.

Category	**Description**
Avian physical traits	
Both sexes physical trait	Physical characteristics that are observable in both males and females of a species
Male physical trait	Physical characteristics that are only observable and clearly identifiable in males of a species
Female physical trait	Physical characteristics that are only observable and clearly identifiable in females of a species
Size	Relative physical size of the species
Avian natural history	
Behavior	Specific behavior associated with the species
Geographic location	Specific geographic location
Natural history	Relates to habitat, nest type, or diet of the species
Human-constructed terminology	
Local language	Phonetic English pronunciation of species name in a non-English language
Miscellaneous	Descriptor that does not clearly fit into any of the other categories
Person	Name of a person

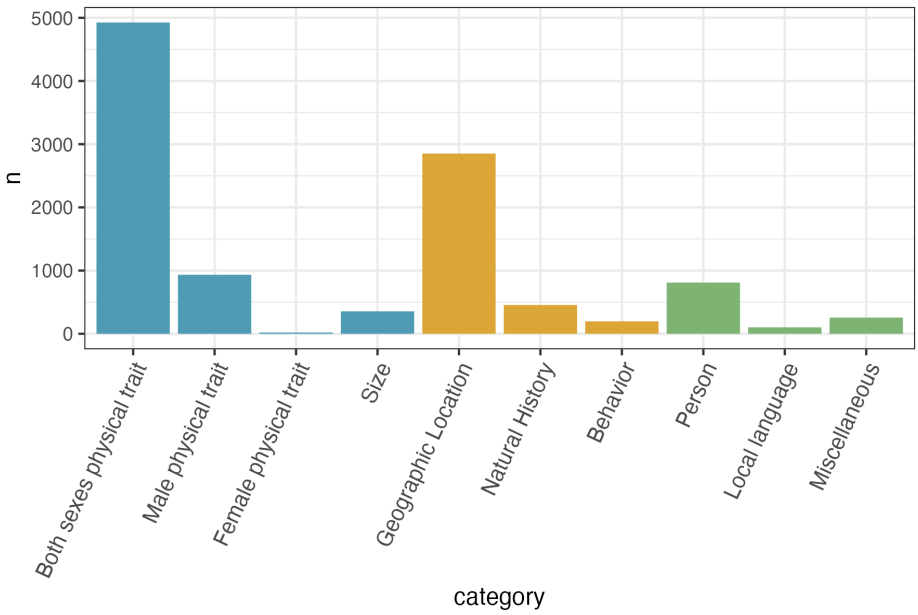

Figure 1. Counts of species per category in the final dataset. Categories are colored by avian physical traits (blue), avian natural history (orange), and human-constructed terminology unrelated to the biology of a species (green).

Table 2. Numbers and proportions of names in different categories.

Category	N	N distinct terms	Proportion distinct terms	Mean times repeated if not unique	Median times repeated if not unique
Both sexes physical trait	4926	1530	0.31	6.30	3
Male physical trait	933	517	0.55	3.62	3
Female physical trait	20	19	0.95	2.00	2
Size	355	28	0.08	22.80	13
Geographic Location	2852	739	0.26	7.02	4
Natural History	455	196	0.43	4.32	2
Behavior	197	145	0.74	3.00	2.5
Person	810	505	0.62	3.19	2
Local language	102	101	0.99	2.00	2
Miscellaneous	256	112	0.44	7.26	4
Total Dataset	10906	3499	0.32	5.89	3

Figure 2. Word cloud of most common descriptors across the dataset. Word sizes are scaled to the number of times they are repeated, and descriptors are colored according to their overall category: avian physical trait (blue), avian natural history trait (orange), and human-constructed terminology (green).

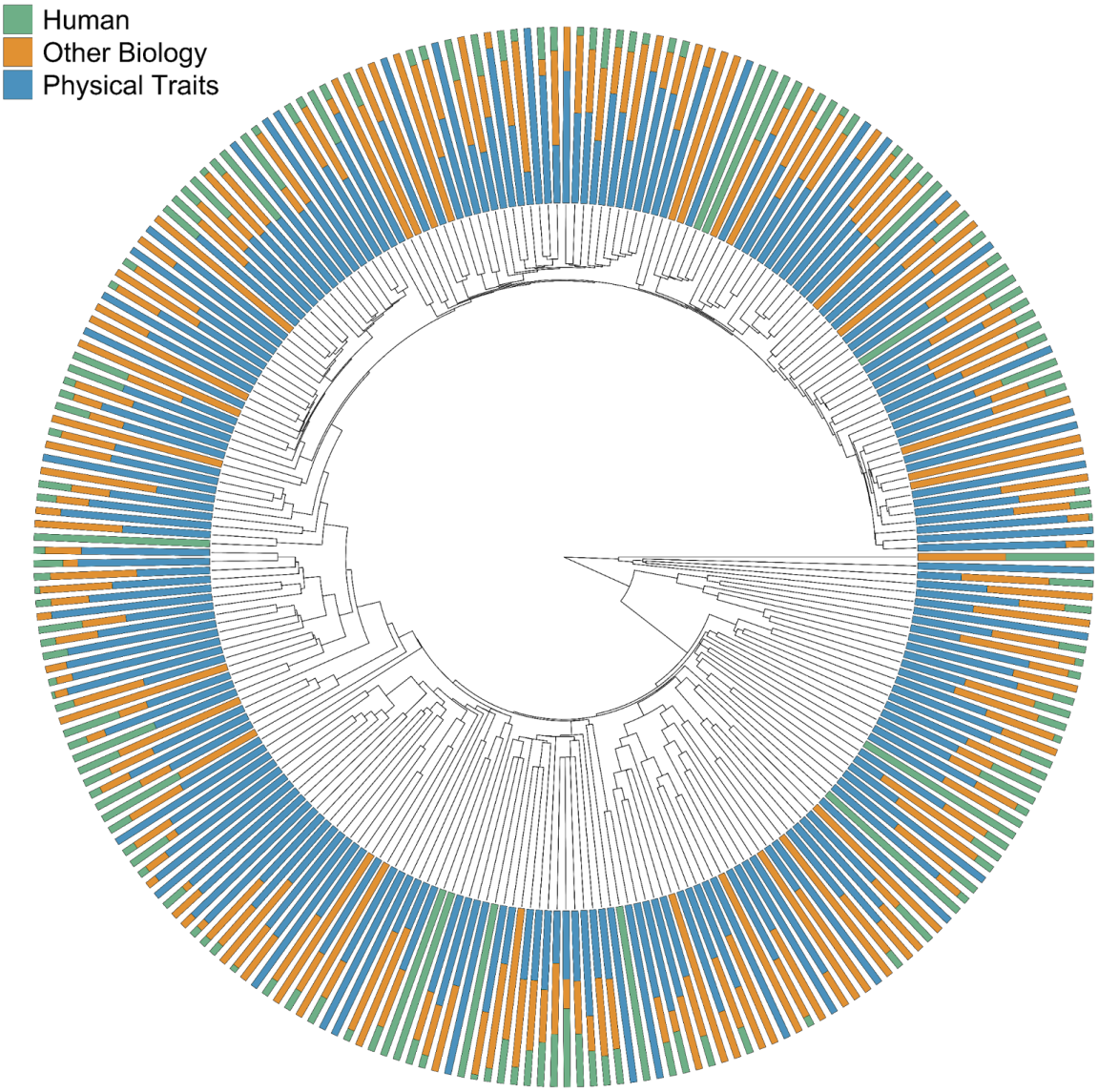

Figure 3. Cladogram of 249 families of birds. The location of each family branch was determined by a representative species in a time calibrated phylogeny of 10,775 species of birds (McTavish et al., 2024). At the tips, the shaded lines represent the proportion of species in each family with English common names associated with the general categories avian physical traits (blue), avian natural history (orange), and human-constructed terminology unrelated to the biology of the species (green) (Supplementary Material Table S1). See Supplementary Material Figure S4 for species-specific name categories mapped to phylogenetic relationships.

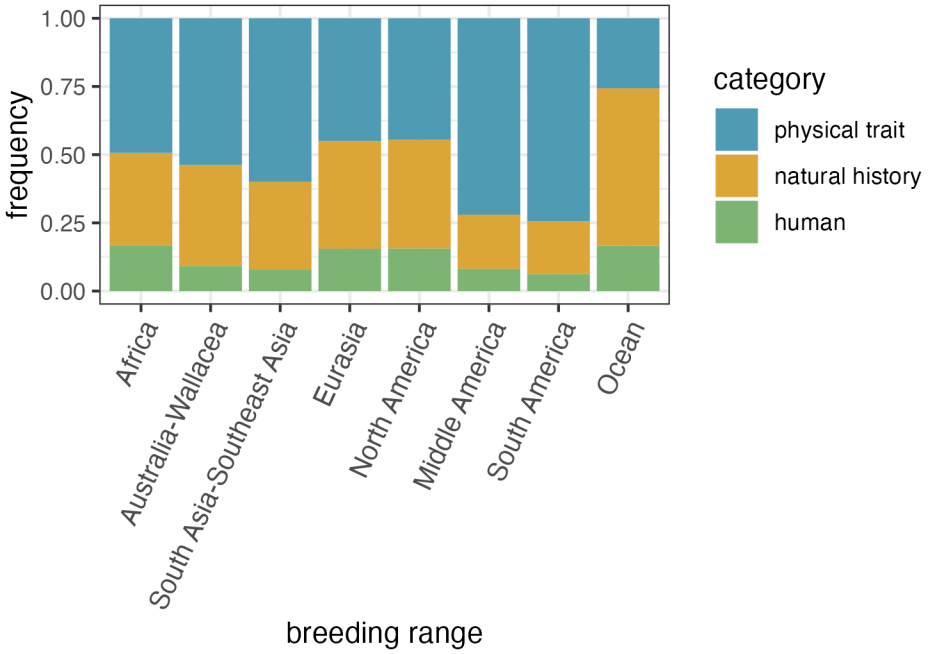

Figure 4. The frequency of general descriptor categories in species' breeding ranges. General categories are avian physical traits (blue), avian natural history (orange), and human-constructed terminology unrelated to the biology of a species (green).