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# Bird singing contests: Looking back on thirty years of research on a global conservation concern

Benjamin H. Mirin<sup>a,b,\*</sup>, Holger Klinck<sup>b</sup>

<sup>a</sup> Department of Natural Resources and the Environment, Cornell University, Ithaca, NY 14853, USA

<sup>b</sup> K. Lisa Yang Center for Conservation Bioacoustics, Cornell Lab of Ornithology, Cornell University, Ithaca, NY 14850, USA

## ARTICLE INFO

## Keywords:

Singing contest  
Wildlife trade  
Songbird  
Conservation  
Education  
Bird-keeping

## ABSTRACT

Keeping wild birds is a deeply engrained and widely prevalent cultural practice, with a history going back thousands of years. One of the more recent trends to emerge from this practice is the singing contest, which pits male birds against each other to impress human judges with their songs, plumage, and movement. A champion bird can garner social prestige and, in some cases, considerable sums of prize money for its human owner. Today these contests drive demand in the global songbird trade, especially in Southeast Asia where more bird species are threatened by trade than in any other region of the world. This literature review aims to describe how we study the songbird trade and identify new research opportunities with a focus on singing contests. We aggregated 219 papers published between 1990 and 2020 and categorized them according to geographic origin, publication date, and academic focus. We found that singing contests currently take place in 19 countries across five of the world's biogeographic regions, using at least 36 species of birds. Our analysis revealed that research on the songbird trade is most prevalent in the Indo-Malay, Neotropic, and Palearctic regions, tends to prioritize birds over humans, and corresponds with the prevalence of singing contests. Education and Outreach had the fewest publications of any discipline in our review, and we conclude this kind of research may provide a valuable basis for future conservation strategies targeting the songbird trade at a global scale.

## 1. Introduction

Humanity's infatuation with birds and their songs has inspired many complex cultural practices, and singing contests are no exception. These competitions typically pit caged male birds against each other in singing bouts before a panel of human judges, who choose champions based on variable criteria such as song diversity, endurance, plumage and movement (Su et al., 2014). Becoming the owner of a champion songbird can elevate a person's social standing, bring prestige, and earn huge financial windfalls (Jepson et al., 2011; Lowen, 2016). In Indonesia, for example, first place at the President's Cup—a national contest—garners a prize of \$80 000 USD (Gill, 2018). What's more, a songbird purchased for a small fee can fetch up to \$20 000 on resale, or 30 times Indonesia's average monthly income, after winning a championship title (Miller, 2017).

The bird singing contests we see today are part of bird-keeping's ancient lineage. As the oldest civilization known to keep written records, ancient Sumerians had a word for bird cage, *subura* (Dennis, 2014). Ancient literature and folk myths from India, China and Japan also depict bird-keeping and even singing contests in various forms (Koyama, 2015; Layton, 1991). Macedonian soldiers under

\* Corresponding author at: Department of Natural Resources and the Environment, Cornell University, Ithaca, NY 14853, USA.  
E-mail address: [bhm48@cornell.edu](mailto:bhm48@cornell.edu) (B.H. Mirin).

<https://doi.org/10.1016/j.gecco.2021.e01812>

Received 29 July 2021; Received in revised form 8 September 2021; Accepted 10 September 2021

Available online 11 September 2021

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Alexander the Great allegedly brought singing parakeets back to Greece after their campaign in India in 327 B.C. (Dennis, 2014), in tandem with bird-keeping's growing popularity across the Greek (and later Roman) empires (Cassey et al., 2015). One of the oldest examples of an actual bird singing contest dates from Edo era Japan (1603–1868), although records go back as far as the 14th century (Kajishima, 2002). Training birds to sing was extremely popular, and aristocrats would host singing contests for two birds at a time from their private homes (Koyama, 2015).

Singing contests also emerged as a pastime in Fifteenth Century Europe, although cultural overlaps with the Asian traditions are difficult to trace. Contests from that era and region are understood primarily through the lens of Western ornithology, which was just emerging as a formal scientific discipline and often drew from lessons learned in the practice of bird-keeping (Birkhead and van Balen, 2008). Singing contests became popular among Flemish merchants in Belgium, who captured and competed wild finches. The tradition is known as *vinkensport* today (Bilefsky, 2007), and it uses the Common Chaffinch (*Fringilla coelebs*). Other modern examples include singing contests in neotropical countries such as Brazil, Guyana and Suriname (Hanks, 2005; Kurmanaev, 2021; Nóbrega Alves et al., 2013), where captive breeding and trade operations are extremely robust. There are also contests in Poland and Russia that use captive-bred canaries (*Serinus canaria*), and contests with *F. coelebs* called *silvestrismo* in Spain (“Poland’s Canary Singing Competition - Pets Factor,” 2017; “Vice Specials: Silvestrismo, juego de trinos,” 2018).

Despite seemingly isolated appearances, the history of the singing contest is inevitably tied to human movement and economics. This became increasingly true during the European diaspora between the eighteenth and nineteenth centuries and the explosion of international trade from the late-twentieth century to today (Cassey et al., 2015). Bird keeping has often been a pastime for the wealthy, but expansion of the middle classes and improved transport capacity facilitated the dissemination of rare and exotic birds across the globe (Cassey et al., 2015). These economic currents flowed between continents, and carried human workers who brought with them bird-keeping traditions that became established in the New World. A prime example is the influx of around 33,000 Javanese contract laborers to Suriname who came to work the country’s sugar plantations after slavery was outlawed in the late 19th Century (Allen, 2011). Bird-keeping is an ancient fixture in Javanese culture, and many of these workers remained in Suriname, becoming the forebears for a thriving Javanese community in the country today.

Researchers in modern times have traced the journeys of traded songbirds in Southeast Asia among multiple countries based on their availability in the wild (Nash, 1993). Recent stories in *National Geographic* (Maron, 2019) and *The New York Times* (Rueb, 2015) have highlighted the emergence of singing contests in Miami, Florida and Queens, New York, predominantly among immigrants from Guyana and Cuba where singing contests are already extremely popular (Ebersole, 2018; Hanks, 2005; Maron, 2019). Still more stories have highlighted police busts of illegal wildlife trade operations between Latin and North America, as smugglers have transported competition birds for sale to expatriate communities abroad (Ebersole, 2018; Rueb, 2015). As human movement across the globe only accelerates, we can expect to see more global networks of competitive bird keepers who collect, train, sell, and celebrate birds for their songs.

Human movement and trade have driven the dissemination not just of singing contests but also of various exotic bird populations around the world. Whether through intentional release into the wild or importation in captivity, communities of bird species are starting to look more similar in localities thousands of miles apart. What do these simultaneous processes of cultural and “biotic homogenization” (Cassey et al., 2015) say about humans’ relationships to the natural world? Perhaps we need to covet and control what we perceive as beautiful or beyond our reach. And by controlling the wild, do we seek to control something within ourselves? Keeping birds brings a piece of nature into our homes, subjugating, commoditizing, and repurposing it for human gain. Like all aspects of bird-keeping, those gains change over time, and can range from social status to financial rewards to newfound connections with nature in an increasingly urban world. In a cage, then, a songbird embodies humanity’s negotiation of our place within the fabric of life as well as our transformation of nature.

But what does that negotiation mean for songbird conservation across the globe? Since the mid-1970 s singing contests have stimulated a robust global trade in both wild-caught and captive-bred songbirds, including a conservatively estimated 1 million CITES-listed birds in Southeast Asia between 1998 and 2007 (CITES, 2019; Jepson, 2010; Maron, 2019; Nijman, 2010). The purpose of this study is to assess the extent of singing contests across the globe and identify gaps in the literature so we may better understand the drivers behind this trade and develop more effective strategies for conservation of traded songbirds. As this review will demonstrate, singing contests currently take place in at least 19 countries across five biogeographic regions (Olson et al., 2001), and the demand for new singers opens international avenues for legal and illegal wildlife trade. Nowhere is this demand for songbirds greater than in Southeast Asia, where competitions have accelerated poaching across much of the region (Jepson, 2010; Miller, 2017; Paddock, 2020; Schweber, 2019). The sheer extent of trade-driven declines among Southeast Asia’s birds has compelled researchers and conservationists to coin a new phrase for the phenomenon, the “Asian Songbird Crisis” (Eaton et al., 2015; Harris et al., 2017; Lee et al., 2016; Nijman, 2010; Owen et al., 2014; Su et al., 2014; Sykes, 2017).

To understand whether similar crises could erupt elsewhere, we first must understand the patterns and progress of our research on the songbird trade and its various components. Very few publications describe birds being traded for their songs before 1990 (McClure and Chaiyaphun, 1971). Using an established set of plans and priorities for conserving trade-threatened birds in Southeast Asia (Lee et al., 2016; Shepherd and Chng, 2017), this review presents a global synthesis of literature about the songbird trade published over the last 30 years, and offers a preliminary description of where singing contests take place around the world, how they affect wild birds, and what opportunities they can reveal for future conservation research specifically in Southeast Asia. While there are likely hundreds of bird species kept for their songs, we focused on birds kept specifically for singing contests to manage the number of papers for this review (see Methods), and because the competitions are so iconic within the bird-keeping world. Furthermore, this review focuses primarily on research published in peer-reviewed English-language journals by academics working at universities, NGOs and research institutes. As such, many systems of knowledge that would enhance our understanding of the songbird trade, such as those retained by

indigenous communities or by those who participate directly in the songbird trade, remain unaddressed. We hope these limits will inspire other scholars to expand on our work.

## 2. Material and methods

Bird singing contests are a driver behind the songbird trade, and in many countries, they contribute to trade-driven declines in wild bird populations. We began this literature review by searching on Google Scholar for articles about the Asian Songbird Crisis, a popular title used to describe the trade pressures sending wild birds toward extinction in Southeast Asia. This preliminary search produced 28 results, 23 of which were in English and clearly related to the trade of wild birds. Our search produced publications written in Indonesian and Portuguese as well, but no one in the team was sufficiently fluent in either language to read them (see Discussion). We used snowballing techniques to identify additional works from the references cited in these preliminary papers and identified key words among them. We used these key words to expand our search on Google Scholar and the Web of Science Core Collections, using phrases such as “bird-keeping,” “conservation” and “songbird trade.” Each search concept was refined with alternative terms, spellings, and Boolean operators. Our search strategy in Google Scholar, for example, produced over 1 300 results with the simple search for “bird keeping,” so we included words like “conservation” and “wildlife trade” to narrow search results. For Web of Science, we changed our set of search terms, because using the same ones produced a lot of redundant results and in some cases non-relevant outputs, such as papers about poultry science related to a search for “bird-keeping.” For this review we focused our search on information about traded songbirds, defined in accordance with Nash (1993) to encapsulate both passerines and non-passerines—such as junglefowl, barbets (*Megalaimidae*) and doves—that are widely appreciated for their songs.

We considered all publications from January 1970 through October 2020, and eliminated results that did not include our search terms in the main text, focused on non-avian taxa, or merely referenced other papers already in our results. The following results were also excluded:

1. Citations and patents.
2. General discussions of academic disciplines.
3. Publications focused on bird species unlikely to be used in singing contests, such as raptors or hornbills.
4. Reviews of wildlife trade on a global scale.

If a paper covered one of the topics above, but included explicit references to singing contests, then we included it in our review. To complete our data set, we consulted domain experts to ensure we had not missed any key publications. We also included seminal works on bird keeping and songbird trade in Southeast Asia such as Nash (1993) and Layton (1991) that provide critical data and cultural context for our research but were not published online. These were still cited extensively in other papers in our review. Other post-search additions included papers that had come up in our independent reading, and which explored less well-documented aspects of singing contests such as their cultural history, expansion to online venues, and occurrence in exceptional geographic locations. These publications added color to our topic and encouraged us to consider it from new angles. Finally, many author additions were media pieces from major news outlets including The New York Times, National Geographic, and the BBC. These stories may have had their own metadata assigned by their authors or editors and used keywords from outside academic discourse. In total, these “Author

**Table 1**

Number of Publications Found by Search String and Search Platform: Different search strings were used on Google Scholar and subsequently on Web of Science to gather information about bird singing contests. Using three different sets of search terms on Google Scholar produced 157 total publications, after which three additional searches were performed on Web of Science. **We used different sets of search terms on Web of Science to reduce the number of irrelevant or redundant results.** This brought the total number of publications to 170. To this we added 15 publications recommended by colleagues at the European Alliance of Zoos and Aquaria, and 34 additional publications deemed relevant by the authors.

| Search string  | Search Platform        | New Results        | Total Publications        |
|--|------------------------|--------------------|---------------------------|
| ("Asian songbird crisis")  | Google Scholar         | 22                 | 22                        |
| <b>Search string</b>   | <b>Search Platform</b> | <b>New Results</b> | <b>Total Publications</b> |
| "Bird keeping" AND ("songbird trade" OR "cage* bird trade") AND conservation                     | Google Scholar         | 18                 | 40                        |
| <b>Search string</b>   | <b>Search Platform</b> | <b>New Results</b> | <b>Total Publications</b> |
| "songbird trade"   | Google Scholar         | 27                 | 67                        |
| <b>Search string</b>   | <b>Search Platform</b> | <b>New Results</b> | <b>Total Publications</b> |
| "Bird keeping" AND ("wildlife trade" OR "cage* bird trade" OR "songbird trade") AND conservation | Google Scholar         | 90                 | 157                       |
| <b>Search string</b>   | <b>Search Platform</b> | <b>New Results</b> | <b>Total Publications</b> |
| ("Bird keeping")   | Web of Science         | 4                  | 161                       |
| <b>Search string</b>   | <b>Search Platform</b> | <b>New Results</b> | <b>Total Publications</b> |
| ("cage* bird trade")   | Web of Science         | 8                  | 169                       |
| <b>Search string</b>   | <b>Search Platform</b> | <b>New Results</b> | <b>Total Publications</b> |
| ("wildlife trade" AND ("songbird" OR "song bird*"))  | Web of Science         | 1                  | 170                       |
| <b>Expert Recommendations</b>  | –                      | <b>New Results</b> | <b>Total Publications</b> |
|  |                        | 15                 | 185                       |
| <b>Author Additions</b>  | –                      | <b>New Results</b> | <b>Total Publications</b> |
|  |                        | 34                 | 219                       |
| <b>Final Totals</b>  |                        |                    | <b>Total Publications</b> |
|  |                        |                    | 219                       |

Additions” (see Results, [Table 1](#)) included 34 additional publications.

We read and summarized abstracts for our set of publications, and sorted them according to conservation priorities identified at the first Asian Songbird Trade Crisis Summit ([Lee et al., 2016](#)). Each of these priorities was developed based on the conservation needs of 28 bird species whose wild populations are threatened by trade ([Sykes, 2017](#)). They were published in 2016 as guidelines for future conservation work and research to help protect Southeast Asia’s songbirds, and we wanted to understand how closely the current body of literature reflected these goals. We also added one additional category, Overall Drivers, to account for studies that investigated the human motivations and the cultural contexts for bird-keeping ([Supplementary Materials](#)). Categories were not necessarily exclusive, and certain publications were assigned more than one. They included:

### 2.1. Overall drivers

Studies examining the social, economic, religious, or environmental incentives for catching, selling, or keeping wild birds and competing birds in singing contests, often as a basis for proposing strategies for behavioral change among consumers. Includes bird owner survey studies that focus on elucidating drivers for the bird trade.

### 2.2. Genetic and field research

Field research on both birds and humans (such as market and bird owner surveys), genetic and other biological studies of traded birds and wild bird populations, studies of the ecological implications of the bird trade (such as invasive species and the spread of disease).

### 2.3. Captive breeding and management of assurance colonies

Studies of captive breeding as a market-based solution to demand for wild birds; studies on avian husbandry and monitoring of release birds and assurance colonies.

### 2.4. Education and outreach

Studies that discuss methods for education and outreach to target stakeholders to achieve more meaningful conservation outcomes.

### 2.5. Trade enforcement and legislation

Studies on trade networks and patterns in the pet and wild bird trades, seizure data, and the impact of legislation on human behavior and bird species in the trade.

We asked research colleagues outside the study to review and categorize ten percent of the papers in our review to make sure our research categories made sense and to make the sorting more objective. Thanks to their insight, we refined the categories further to focus on research methods and apply more closely to research at a global scale. For example, bird market surveys, interviews with bird owners, and surveys of wild bird populations were all designated under “Genetic, Field and Ecological Research” because they involved fieldwork accounting for bird species in a particular setting or ecosystem.

Next we categorized our search results according to countries and ecoregions of the world ([Olson et al., 2001](#)) to explore how conservation priorities for traded birds in Southeast Asia might compare to those in other regions where singing contests take place. We sorted these results among the five categories described above and labeled all our entries according to their publication date (and in one case the date of data collection) to examine how research on singing contests has changed over time.

We filtered our results to publications that explicitly referenced bird singing competitions by searching for the words “contest,” “competition,” “singing,” or “song” in each document. Our goal was to identify species used in singing contests on a global scale and what kinds of research questions such a global picture could support. We identified these species by ecoregion to understand which parts of the world produced the greatest variety of competition birds, and compare consumer preferences for particular species across the globe. We also reviewed the conservation status (where available) for all competition species identified ten or more times in the literature to begin to understand the impact of singing contests on avian conservation at a global scale.

Finally, we examined cumulative publication trends over time to infer how research might change with increased attention toward the songbird trade and singing competitions. We measured changes in the number of publications both globally and regionally, comparing how scholars in different disciplines and regions of the world published before and after the first Asian Songbird Trade Crisis Summit in 2015. This allowed us to look for patterns in how scholars study these topics, what if any gaps might remain in the literature, and what opportunities there are for future research.

## 3. Results

### 3.1. How many papers address each of the conservation priorities?

This study produced a total of 219 publications ([Table 1](#)) dating back to 1991. One publication recommended by an outside expert dated to 1971 ([McClure and Chaiyaphun, 1971](#)), but was excluded from our analysis of research trends because it was so much older

than the rest (however it is included in our [Supplementary Materials](#) for completeness). Of the publications analyzed, one hundred fifty-five (70.7%) were peer-reviewed publications (papers and letters in academic journals). Ten (4.6%) were books and book chapters, 26 (11.9%) were industry reports, 13 (5.9%) were theses or dissertations, and 15 (6.8%) were stories from popular media such as newspapers, magazines, blogs and radio. Research on Overall Drivers appeared in 94 publications (42.9%), Genetic, Field and Ecological Research appeared in 126 publications (57.5%), Captive Breeding and Assurance Colony Management research appeared in 27 publications (12.3%), and research on Trade Legislation and Enforcement appeared in 72 publications (32.9%). There were only 17 (7.8%) peer-reviewed publications focused on Education and Outreach, but we chose to include the 15 publications from popular media as examples of outreach because they shared information about the songbird trade with non-academic audiences. This brought the total number of Education and Outreach publications to 32 (14.6%). Some publications presented research on more than one category and were marked for each conservation priority they addressed.

### 3.2. Geographic distribution of the literature

The total number of publications focused on each biogeographic region in our study are summarized in [Table 2](#). Some papers focused on multiple regions and were counted for each region they represented.

The Indo-Malay region had the greatest number of publications in every category. The Neotropics and the Palearctic accounted for the second and third highest respective totals for 1) Human Motives and Cultural Context; 2) Genetic, Field and Ecological Research; 3) Captive Breeding and Colony Management; and 4) Trade Legislation and Enforcement. The Nearctic, Palearctic, and Neotropical regions, as well as the global category, produced an equal number of works in Education and Outreach. Oceania produced zero publications in the search and was excluded from successive analyses.

Genetic, Field and Ecological works represented the majority of publications in every region except the Afrotropics, where the majority focused on Trade Legislation and Enforcement. Overall Drivers and Trade Legislation and Enforcement were the second and third largest categories for publications in the Indo-Malay, Neotropical and Palearctic regions ([Fig. 1](#)). Captive Breeding and Colony Management had the lowest overall number of publications across the globe (27), but publications focused on Education and Outreach appeared in the fewest biogeographic regions. When popular press articles were removed from the dataset, Education and Outreach had only 17 publications, making it the least represented category in academic research as previously stated.

### 3.3. Regional distribution of singing contests and species used

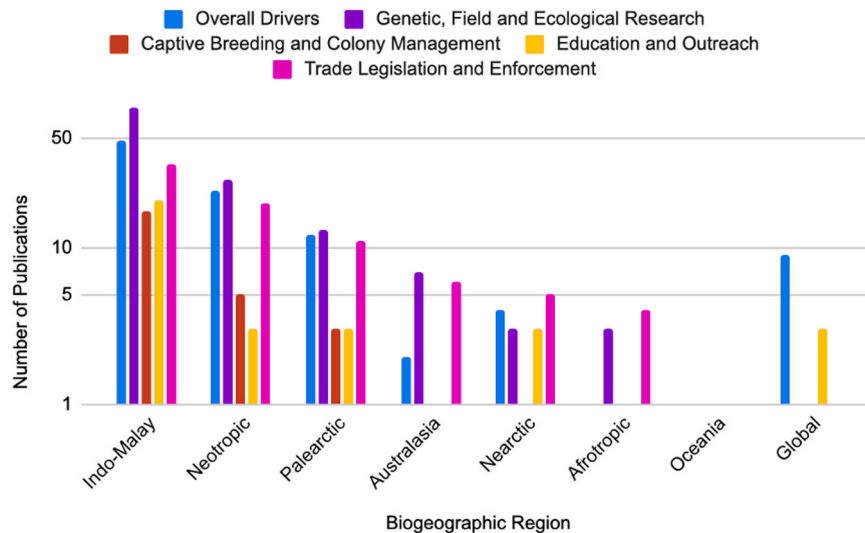
Eighty-six of the 219 publications (39.3%) explicitly referenced bird singing contests. Among these, 60 (69.8%) were from the Indo-Malay region, representing 48.8% of all publications from that area. The **Neotropics produced 14 references (16.3%; 30.4%)**, the Palearctic 11 (12.8%; 39.3%), **the Nearctic 4 (4.7%; 40%)**, and Australasia 2 (2.3%; 16.7%). **Two papers with a global perspective also made explicit references to singing contests (2.3%; 20%)**, and there were no such references from the Afrotropics. These regional focuses were not exclusive, as certain publications discussed singing contests across multiple continents and regions.

According to the literature, **at least 36 bird species are used for singing competitions in the world today (although the real number is probably much higher)**. Four additional species have been used historically but may not be used today. The literature also referenced an additional three families and three orders that are used in singing contests but did not specify the species used from these groups ([Table 3](#)). The Indo-Malay region had by far the greatest number of competition birds, with 23 described species and members of an additional three families and three orders used in competitions today. Literature from this region also contained historic references to

**Table 2**

Number and Percentage of Publications for Songbird Trade Research by Biogeographic Region: This table presents the geographic distribution of literature about the songbird trade at a global scale, with each number as a percentage of the total number of papers per region. For every research category, most publications focus on the Indo-Malay ecoregion, followed by the Neotropics and Palearctic. The one exception to this pattern was Education and Outreach. Indo-Malay produced most publications in this research category, and four other ecoregions each produced the same number of publications. Certain publications in the data set focused on multiple biogeographic regions and were counted for each region they represented. Some publications were also counted toward multiple research categories, so the total number of publications in this table exceeds the regional totals specified below.

| Research Category by Biogeographic Region | Afrotropic   | Australasia  | Global     | Indo-Malay    | Nearctic   | Neotropical   | Oceania | Palearctic    | Category Totals |
|---|--------------|--------------|------------|---------------|------------|---------------|---------|---------------|-----------------|
| <b>Human Motives and Cultural Context</b> | 0            | 2<br>(16.7%) | 9<br>(90%) | 48<br>(39%)   | 4<br>(40%) | 23<br>(50%)   | 0       | 12<br>(42.7%) | 98              |
| Genetic, Field and Ecological Research    | 3<br>(42.9%) | 7<br>(58.3%) | 1<br>(10%) | 78<br>(63.4%) | 3<br>(30%) | 27<br>(58.7%) | 0       | 13<br>(46.4%) | 132             |
| Captive Breeding and Colony Management    | 0            | 1<br>(8.3%)  | 0          | 17<br>(13.8%) | 1<br>(10%) | 5<br>(10.9%)  | 0       | 3<br>(10.7%)  | 27              |
| Education and Outreach                    | 0            | 0            | 3<br>(30%) | 20<br>(16.3%) | 3<br>(30%) | 3<br>(6.5%)   | 0       | 3<br>(10.7%)  | 32              |
| Trade Legislation and Enforcement         | 4<br>(57.1%) | 6<br>(50%)   | 1<br>(10%) | 34<br>(27.6%) | 5<br>(50%) | 19<br>(41.3%) | 0       | 11<br>(39.3%) | 80              |
| <b>Regional Totals</b>                    | 6            | 12           | 10         | 123           | 10         | 46            | 0       | 28            |                 |
| <b>Singing Contest References</b>         | 0            | 2            | 2          | 60            | 4          | 14            | 0       | 11            |                 |



**Fig. 1.** Songbird Research Focus by Biogeographic Region: Six publications from the dataset focused on the Afrotropics, 12 on Australasia, 10 had global perspectives, 123 focused on the Indo-Malay region, 10 on the Nearctic, 46 on the Neotropics, zero on Oceania and 28 on the Palearctic.

one family (Psittacines) and two additional species not already described in the contemporary contest world, Budgerigars (*Melopsittacus undulatus*) and Java Sparrows (*Lonchura oryzivora*) (James A. Eaton et al., 2017; Yim, 2008). The most frequently referenced competition birds were White-rumped Shama (*Kittacincla malabarica*, 27 references), Zebra Dove (*Geopelia striata*, 15 references), White-eyes (*Zosterops* spp., 14 references), Straw-headed Bulbul (*Pycnonotus zeylanicus*, 10 references), and Orange-headed Thrush (*Geokichla citrina*, 10 references).

Literature from the Neotropics described ten bird species used for singing contests. The most frequently cited species was the Chestnut-bellied Seedfinch (*Sporophila angolensis*, 10 references), which is also a competition bird in the Nearctic alongside the Painted Bunting (*Passerina ciris*, 1 reference) (Maron, 2019; Rueb, 2015). The Chaffinch (*Fringilla coelebs*, 2 references), European Goldfinch (*Carduelis carduelis*, 1 reference), Hwamei (*Garrulax canorus*, 1 reference), Varied Tit (*Cyanistes varius*), and Bush Warbler (*Horornis diphone*) were the only species explicitly described as competition birds in the Palearctic, and *C. varius* and *H. diphone* were described as historical examples from Edo Era (17th to 19th Century) Japan (Koyama, 2015). The two publications with global perspectives did not specify any particular species used in competition, and one of the two publications from Australasia described a close relative of *Z. citrina*, the Orange-sided Thrush (*Z. peronii peronii*) as a competition bird.

Among the bird species described in the literature, six (including one family) are referenced ten or more times, and four of those are experiencing population declines in the wild (Birdlife International, 2016, 2017, 2018a, 2018b, 2019). These competition species and their regional affiliations are summarized in Table 4.

### 3.4. Publication trends over time

Sixty-eight publications (31%) were published before 2015, the year when the first Asian Songbird Trade Crisis Summit took place. Thirty-five of these were focused on the Indo-Malay region. The remaining 69% of publications arrived either in the same year or in years after the Summit. The publication trends for each category of songbird trade research over time are shown in Fig. 2.

Publication trends in all but two of the ecoregions followed a similar pattern, with approximately two-thirds of publications emerging after 2015 (Table 5). Genetic, Field and Ecological publications showed the greatest increase in the Indo-Malay, Neotropic, and Palearctic regions, followed by research in Overall Drivers and in Trade Legislation and Enforcement. In the Nearctic and Afrotropics, publications on Trade Legislation and Enforcement increased the most after 2015, while papers on Overall Drivers increased the most among papers with a global focus. In Australasia, publications on Genetic, Field and Ecological research and Trade Legislation and Enforcement increased the most after 2015.

More publications in our study focused on the Indo-Malay region than any other ecoregion between 1990 and 2020. This was ubiquitous for every category of research on the songbird trade. Half of the academic disciplines represented in our research categories also focused on this part of the world before any other. The Neotropics were the focus for the second-highest number of publications in Overall Drivers, Genetic, Field and Ecological studies, and Trade Legislation and Enforcement. The Palearctic was the focus for the second-highest number of publications on Captive Breeding and Assurance Colony Management. Second to the Indo-Malay region, all ecoregions except the Afrotropics and Australasia were the focus of an equal number of publications on Education and Outreach. The earliest publications about Overall Drivers (published in 1991), Education and Outreach (1991), and Trade Legislation and Enforcement (1991) all focused on the Indo-Malay region. The first publications in Captive Breeding and Assurance Colony Management (1991) focused on the Palearctic and Neotropic regions, and the first publications in Genetic, Field and Ecological research (1992) focused on the Afrotropic, Indo-Malay, and Neotropic regions, respectively. The complete trends for each research category by

**Table 3**

Bird Species and Families Used in Singing Competitions: These are the bird species used in singing contests around the globe according to academic literature and news media published during the last 30 years. Asterisks indicate historical references to competition birds that may no longer be used today.

| Region of Use                    | Species, Family, or Order                                     |
|----------------------------------|---|
| Indo-Malay                       | Bar-winged Prinia ( <i>Prinia familiaris</i> )                |
| Indo-Malay                       | Black-throated Laughingthrush ( <i>Garrulax chinensis</i> )   |
| Indo-Malay                       | Blue-winged Leafbird ( <i>Chloropsis cochinchinensis</i> )    |
| Indo-Malay                       | Brown Prinia ( <i>Prinia polychroa</i> )                      |
| Indo-Malay                       | Budgerigar ( <i>Melopsittacus undulatus</i> )*                |
| Indo-Malay                       | Chestnut-capped Thrush ( <i>Zoothera interpres</i> )          |
| Indo-Malay                       | Common Iora ( <i>Aegithina tiphia</i> )                       |
| Indo-Malay                       | Greater Green Leafbird ( <i>Chloropsis sonnerati</i> )        |
| Indo-Malay                       | Grey-cheeked Bulbul ( <i>Criniger bres</i> )                  |
| Indo-Malay                       | Hill Blue Flycatcher ( <i>Cyornis banyumas</i> )              |
| Indo-Malay                       | Hill Myna ( <i>Gracula religiosa</i> )                        |
| Indo-Malay                       | Java Sparrow ( <i>Lonchura oryzivora</i> )*                   |
| Indo-Malay                       | Javan Pied Starling ( <i>Gracupica jalla</i> )                |
| Indo-Malay                       | Long-tailed Shrike ( <i>Lanius schach</i> )                   |
| Indo-Malay                       | Lovebirds ( <i>Agapornis</i> spp.)                            |
| Indo-Malay                       | Orange-headed Thrush ( <i>Zoothera citrina</i> )              |
| Indo-Malay                       | Orange-sided Thrush ( <i>Zoothera peronii peronii</i> )       |
| Indo-Malay                       | Oriental Magpie Robin ( <i>Copsychus saularis</i> )           |
| Indo-Malay                       | Other starlings ( <i>Sturnidae</i> )                          |
| Indo-Malay                       | Parrots ( <i>Psittacidae</i> )                                |
| Indo-Malay                       | Pied Stonechat ( <i>Saxicola caprata</i> )                    |
| Indo-Malay                       | Red-whiskered Bulbul ( <i>Pycnonotus jocosus</i> )            |
| Indo-Malay                       | Singing Bush-lark ( <i>Mirafra javanica</i> )                 |
| Indo-Malay                       | Straw-headed Bulbul ( <i>Pycnonotus zeylanicus</i> )          |
| Indo-Malay                       | Sunbirds ( <i>Nectariniidae</i> )                             |
| Indo-Malay                       | Tailorbirds ( <i>Orthotomus</i> spp.)                         |
| Indo-Malay                       | Taiwan Hwamei ( <i>Garrulax taewanus</i> )                    |
| Indo-Malay                       | White-eyes ( <i>Zosterops</i> spp.)                           |
| Indo-Malay                       | White-rumped Shama ( <i>Kittacincla malabaricus</i> )         |
| Indo-Malay                       | Zebra Dove ( <i>Geopelia striata</i> )                        |
| Indo-Malay, Nearctic, Palearctic | Atlantic Canary ( <i>Serinus canaria</i> )                    |
| Nearctic                         | Painted Bunting ( <i>Passerina ciris</i> )                    |
| Neotropical                      | Double-collared Seedeater ( <i>Sporophila caeruleascens</i> ) |
| Neotropical                      | Green-winged Saltator ( <i>Saltator similis</i> )             |
| Neotropical                      | Large-billed Seedfinch ( <i>Sporophila crassirostris</i> )    |
| Neotropical                      | Lined Seedeater ( <i>Sporophila lineola</i> )                 |
| Neotropical                      | Plumbeous Seedeater ( <i>Sporophila plumbea</i> )             |
| Neotropical                      | Ruddy-breasted Seedeater ( <i>Sporophila minuta</i> )         |
| Neotropical                      | Saffron Finch ( <i>Sicalis flaveola</i> )                     |
| Neotropical                      | Slate-colored Seedeater ( <i>Sporophila schistacea</i> )      |
| Neotropical, Nearctic            | Chestnut-bellied Seedfinch ( <i>Sporophila angolensis</i> )   |
| Palearctic                       | Bush Warbler ( <i>Horornis diphone</i> )*                     |
| Palearctic                       | Common Chaffinch ( <i>Fringilla coelebs</i> )                 |
| Palearctic                       | European Goldfinch ( <i>Carduelis carduelis</i> )             |
| Palearctic                       | Varied Tit ( <i>Cyanistes varius</i> )*                       |
| Palearctic, Indo-Malay           | Hwamei ( <i>Garrulax canorus</i> )                            |

ecoregion are summarized in Fig. 3.



## 4. Discussion

### 4.1. Which conservation priorities need more attention?

Literature on the songbird trade is primarily academic, with a few industry reports, book chapters and articles in popular media. The majority of these efforts focused on the birds themselves, producing studies in genetics, ecology and field biology, as well as field surveys of birds sold in markets and kept in people's homes. Within the 123 publications focused on Genetic, Field and Ecology Research, 21 were surveys of wild bird populations while 52 were bird market and bird-owner surveys. Six additional studies had a combined focus on both. This may reflect a recent trend in research to use market and household surveys to extrapolate population trends in the wild. These urban studies can be more efficient than field studies and reflect a popular trend to examine market-based interventions for songbird conservation, inspired largely by Jepson and Ladle (Jepson and Ladle, 2005, 2009; Jepson et al., 2011). Simultaneously, the disparity suggests that we still need more studies of wild bird populations to complement proxy data from markets and bird-keeping households. Perhaps the best solution would be more multi-disciplinary studies that take a combined look at songbirds in the forests where they once were plentiful and the cages where many sing today.

**Table 4**



Conservation Status of the Birds Most Often Used Globally in Singing Contests: These are the competition species referenced ten or more times in the global literature on bird singing contests. The conservation status for each species is provided based on the latest updates to the IUCN Red List, although some listings are being reevaluated, and some may not account for local extirpations of widespread species such as *K. malabarica*. One exception to this list is the status for the White-eye (*Zosterops* spp.) which is not identified at the species level in most of the publications where it is referenced, and which therefore did not have a corresponding entry on the IUCN Red List.

| Common Name        | Scientific Name               | Biogeographic Region | IUCN Red List Status | Population Trend | Image  |
|--------------------|-------------------------------|----------------------|----------------------|------------------|--|
| White-rumped Shama | <i>Kittacincla malabarica</i> | Indo-Malay           | LC                   | Decreasing       |   |
| Zebra Dove         | <i>Geopelia striata</i>       | Indo-Malay           | LC                   | Stable           |  |

(continued on next page)





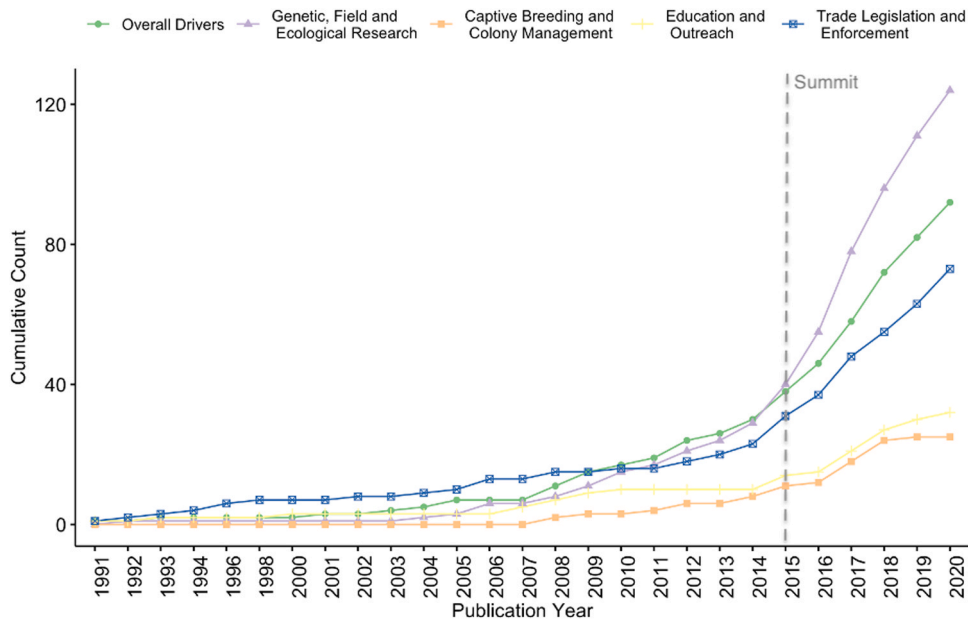
Table 4 (continued)

| Common Name         | Scientific Name              | Biogeographic Region | IUCN Red List Status | Population Trend | Image  |
|---------------------|------------------------------|----------------------|----------------------|------------------|--|
| White-eyes          | <i>Zosterops</i> spp.        | Indo-Malay           | N/A                  | N/A              |   |
| Straw-headed Bulbul | <i>Pycnonotus zeylanicus</i> | Indo-Malay           | CR                   | Decreasing       |  |

(continued on next page)

Table 4 (continued)

| Common Name                | Scientific Name              | Biogeographic Region | IUCN Red List Status | Population Trend | Image   |
|----------------------------|------------------------------|----------------------|----------------------|------------------|---|
| Orange-headed Thrush       | <i>Geokichla citrina</i>     | Indo-Malay           | LC                   | Decreasing       |  A photograph of an Orange-headed Thrush (Geokichla citrina) perched on a branch. The bird has a bright orange head and neck, a blue back and wings, and a white belly. It is facing left. The background is a blurred green forest. A small caption at the bottom left of the image reads: "Orange-headed Thrush <i>Zosterops citrina</i> © 2018 National Park, Thailand © 2018 By Nathanael Oropke/istockphoto". |
| Chestnut-bellied Seedfinch | <i>Sporophila angolensis</i> | Neotropic/Nearctic   | LC                   | Increasing       |  A photograph of a Chestnut-bellied Seedfinch (Sporophila angolensis) perched on a branch. The bird has a black head and back, and a chestnut-colored belly. It is facing right. The background is a blurred green forest.  |



**Fig. 2. Cumulative Publication Totals Over Time: Research in every category increased significantly following the first Asian Songbird Trade Crisis Summit in 2015.** Sixty-two publications from Overall Drivers (67.4%), 95 (77.2%) from Genetics, Field and Ecology, 17 (68%) from Captive Breeding and Assurance Colony Management, 22 (68.8%) from Education and Outreach, and 50 (68.5%) from Trade Legislation and Enforcement came out in 2015 or later. In terms of papers per year and cumulative total publications, Genetic, Field and Ecological research increased the most following the year of the summit, followed by research in Human Motives and Cultural Context and research in Trade Legislation and Enforcement (Fig. 2).

**Table 5**

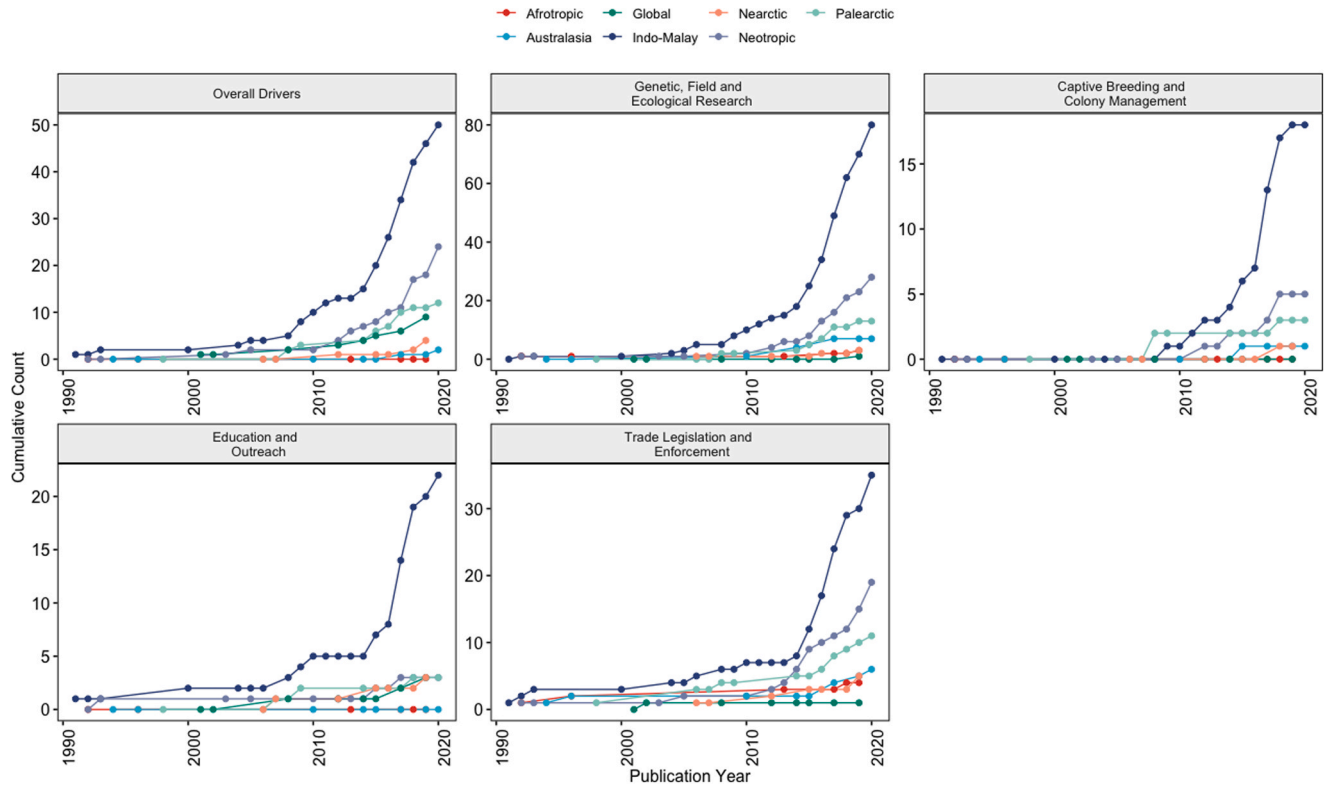
Number of Publications Released Before and After 2015: These numbers are not exclusive, as certain papers addressed topics from more than one region.

| Biogeographic Region | Number of Publications Before 2015 | Number of Publications During and After 2015 |
|----------------------|------------------------------------|--|
| Afrotropic           | 3                                  | 3 (50%)                                      |
| Australasia          | 6                                  | 6 (50%)                                      |
| Global               | 5                                  | 5 (50%)                                      |
| Indo-Malay           | 35                                 | 88 (71.5%)                                   |
| Nearctic             | 3                                  | 7 (70%)                                      |
| Neotropic            | 13                                 | 33 (71.7%)                                   |
| Palaearctic          | 9                                  | 19 (67.9%)                                   |

The second largest group of publications focused on the social, economic, faith-based or environmental incentives for trading birds, often using visual and written surveys to gather data. This group had some overlap with the first, but not enough to artificially inflate the publication totals beyond reasonable comparison. The third largest group focused on patterns and networks in the wildlife trade, often analyzing historical seizure data as a proxy for measuring the impact of legislation on birds and human behavior in the songbird trade.

The literature examined in this study focused most on threatened birds, and subsequently on the human conditions and influences shaping those species' survival. Trade legislation and enforcement is the most-researched solution for trade-driven songbird declines, reflecting a dominant "top-down" approach to combating wildlife trade through enforcement (ooney et al., 2017). Legislation and enforcement play central roles in combating illegal wildlife trade around the world, but such "status quo" conservation practices (Holmes and Cavanagh, 2016) can also overlook socioeconomic and cultural realities that significantly affect the fate of wild animals and places (Bennett and Roth, 2018). Without thinking of people in our conservation efforts, we can create negative social impacts and conservation backlash (ooney et al., 2017; West and Brockington, 2006; West et al., 2006). When considering the conservation impacts of an ancient cultural practice like bird-keeping, we ignore the needs and cultures of local people at our own peril, and the peril of birds.

Studies in captive breeding and education are conspicuously lacking. Without articles from non-academic sources, the 17 peer-reviewed publications about Education and Outreach represent the least-studied dimension of the songbird trade. Publications from the 2015 Asian Songbird Trade Crisis Summit (Capotosto and Shepherd, 2015; Lee et al., 2016; Shepherd and Chng, 2017; Shepherd and Cassey, 2017; Sykes, 2012) cite a lack of public awareness as a major factor compounding the challenges to bird conservation in the area, but the opportunity for new research in this space is immense and still largely undefined. This represents a



**Fig. 3.** Trends In Different Types Of Research On The Songbird Trade By Region Over Time. Research in the Indo-Malay region set the curve for all research categories in this review, with the most publications in every category and the first publications in Genetic, Field and Ecology, Trade Legislation and Enforcement, Education and Outreach, and Overall Drivers.

chance to reframe songbird conservation in Southeast Asia and other global regions as a human-centric endeavor in a space where many publications model more traditional, bird-focused approaches to such work.

Defining opportunities for education and outreach depends on identifying one's intended audience. Authors in our review offer several targets for outreach that could affect change for songbirds, such as aviculturalists in Latin America (Fink et al., 2017), Islamic boarding schools in Southeast Asia (Mangunjaya and Praharawati, 2019), bird trappers who may become park wardens and rangers (J A Eaton et al., 2015), and bird vendors who learn to identify species moving through their shops (Gardner, 2017). Other studies describe how people relate to birds by measuring species' presence in online search results (Ladle et al., 2019) or measuring interest in rare versus common birds among visitors at a public zoo (Angulo et al., 2009). Ladle and Jepson (2008), Drury (2009) and BirdLife International (2010) use these relationships to address issues in songbird conservation. These include how people's ideas about extinction can shape conservation strategy (Ladle and Jepson, 2008), and whether songbird-keepers should be encouraged to purchase farm-raised birds instead of birds trapped in the wild (Birdlife International, 2010; Drury, 2009). Articles from popular media focus on describing singing contests for a layman audience, highlighting how they work, what birds they use, and their economic and conservation impacts (Ebersole, 2018; Gill, 2018; Maron, 2019), or presenting them as human interest stories (Bilefsky, 2007; Rueb, 2015; "Vice Specials: Silvestrismo, juego de trinos", 2018).

Overall, research on the songbird trade is still quite limited, as our search only produced 219 results, 49 of which came from extensive independent reading and were not reflected in our search results. In contrast to the ancient practice of bird-keeping, this research is relatively new, perhaps because the songbird trade has only recently reached unsustainable levels, thereby drawing academic and conservation attention in the last few decades (Jepson, 2010). With no end to the trade in sight, we recommend additional theoretical and applied research across all of the five disciplines in our study, especially those with lower numbers of publications so far. We also recommend that future reviews incorporate publications in languages other than English. Making inferences based solely on the works reviewed here limits the potential impact of future research and overlooks how people may discuss songbird conservation and trade in other languages. Bird-keeping extends far beyond the English-speaking world. Neglecting this creates a knowledge gap between research and reality. Unless we account for publications in other languages, such gaps are likely to be filled by "parachute science" (Barber et al., 2014) and conservation strategies lacking the intimate knowledge and context needed to create meaningful change for birds and people alike.

#### 4.2. Geographic distribution of the literature

Most publications in our review focused on the Indo-Malay ecoregion, both overall and in each individual research category. Literature from this region also contained the greatest number of references to singing competitions as a proportion of the regional total. Many of these publications came from authors based outside the region, but nevertheless it is clear that Southeast Asia has offered the greatest amount of knowledge about the bird trade and singing competitions over the past 30 years. The Neotropics and Palearctic produced the second- and third-highest respective numbers of publications and references to singing contests during this period, making them ideal regions for future scholars to expand our understanding of singing competitions and pilot new studies on the bird trade at large.

Research in the Indo-Malay, Neotropic and Palearctic ecoregions all focused on similar disciplines in similar proportions. The most popular areas of study in these places were Genetics, Field Biology and Ecology, followed by Human Motives and Cultural Context and Trade Legislation and Enforcement. This pattern matches global trends in songbird trade research. It did not hold in other ecoregions, but with small numbers of publications from the Afrotropics, Nearctic, and Australasia it is difficult to say whether a similar pattern would emerge in these locations once more research is published.

This review focused on papers written in English, but also uncovered works in other languages such as Indonesian, Portuguese and Spanish. No one in our team was sufficiently fluent in these languages to read these articles, but it is worth noting that Indonesia, Brazil, and several Spanish-speaking countries in Latin America are developing bodies of literature about the bird trade and singing contests. We encourage anyone pursuing further research into these phenomena to familiarize themselves with singing contest terminology in other languages to facilitate search, and to reach out to local academics in these countries to start a deeper academic discussion and open possibilities for transnational collaboration. Many of these places produce important scholarly work, and they should not be overlooked.

#### 4.3. Regional distribution of singing contests and species used

This review found evidence of bird singing contests in 19 countries and territories across five of the world's biogeographic regions. Bird singing contests are a global phenomenon. In the months since this review was completed, we have found evidence of contests in new locations, bringing the total list of countries to 22. As a natural outgrowth of bird-keeping, it may be of little surprise that singing contests are so widespread. Singing contests also appear to move among different countries through cultural transmission, carried by human migrations to new frontiers around the world (Andel et al., 2003; Fink et al., 2017; Gibson, 2020; Ortiz-von Halle, 2018; Rueb, 2015; Verheij, 2019). The preference for particular species can be transmitted as well, particularly when a competition bird has a wide geographic range and can be poached in multiple locations. Examples of such species include *K. malabarica* in Southeast Asia and *S. angolensis* in South America. When a popular species becomes scarce in one part of its range, populations in other regions will come under increased poaching pressure to meet demand (Eaton et al., 2015; Rising and Jaramillo, 2020; Shepherd et al., 2004).

With 36 species used in singing contests, our review probably reveals just a fraction of the high species richness of birds kept for their songs. Such diversity would not be surprising given that songbird's beautiful appearances and singing abilities have attracted

people since ancient times (Alves and Rocha, 2018; Carrete and Tella, 2008; Collar et al., 2007; Grier, 2010; Tidemann and Gosler, 2010). However, this richness is mostly characteristic of the Indo-Malay region, while other regions tend to favor just a few species. Southeast Asia may have the greatest number of species in competition because demand is so high that poachers and vendors are forced to look for new species to satiate consumers. The rate at which new species enter the trade might also outpace the literature, such that some species may be more prevalent in trade than our review suggests (Iqbal, 2015; Jepson and Ladle, 2009). Furthermore, bird-keeping and singing contests are so popular that many people simply want to own a bird without caring what species it is (Marshall et al., 2020). The region's considerable avian diversity also gives traders more species to sell, but does not explain the lack of species diversity in song contests in the Neotropics, the region with the greatest diversity of bird species in the world. Competition birds in the Neotropics largely come from the same family, Thraupidae, which may reflect a convergence of human preferences for similar birds, as well as a more discerning consumer base in the songbird trade. **Future research could compare popular birds from these ecoregions to see what kinds of songs (and other traits) earn the love of bird-keepers in different parts of the world, comparing songs through bioacoustic analysis and human preferences through ethno-ornithological surveys and playback experiments. Understanding these biological drivers of human preferences—in a style similar to Scheffers et al. (2019)—would be invaluable in marketing and public outreach campaigns designed to curb or redirect consumer habits in the bird trade.**

There are five bird species and one family referenced more than any other in connection with singing contests across the world. Among them, three are experiencing population declines at least in part because of pressure from the songbird trade (Lee et al., 2016). These species—*K. malabarica*, *P. zeylanicus*, and *Z. citrina*—have already been in high demand for over a decade (Jepson and Ladle, 2008, 2009). One exception from the list is *G. striata*, which has a stable population most likely because there are extensive captive breeding operations to meet demand for this species (Jepson et al., 2011; Marshall et al., 2020; Nash, 1993). Another exception is *S. angolensis*, which has an increasing population according to the IUCN Red List (Birdlife International, 2018b). This could be because *S. angolensis* has an extremely large range of over 14 million square kilometers across the Caribbean and South America (Birdlife International, 2021). Populations of this bird in Trinidad and Tobago have declined dramatically in recent years due to trapping pressure, and birds are now being smuggled to the region from countries in South America (Gibson, 2020; Rising and Jaramillo, 2020), but this local crash appears not to impact population trends for the species overall.

As bird-keeping continues to drive the global songbird trade, it becomes **increasingly important to find out where these singing contests take place and what impacts they may have on local avifauna. This is not easy, as human preferences for songbirds change from year to year based on broader socioeconomic and environmental trends, legislation, and what is in fashion** (Iqbal, 2015; Jepson and Ladle, 2009). Tracking the birds used in singing contests generally requires close monitoring of markets and competitions (Eaton et al., 2015), and we **need more studies that examine these events closely from an ethnographic point of view.** In addition, we recommend monitoring social media platforms like YouTube and Facebook. Nijman (2010), Martin et al. (2018), and Souto et al. (2017) have shown that social media drives much of the bird trade, and may influence consumer preferences for new species. We explored these platforms during our review, and found that many bird breeders advertise their birds for sale on Facebook, and bird trainers (called “jockeys”) often use looped bird song videos on YouTube to stimulate captive birds and train them for competition. Many singing contests are also publicized on Facebook and documented on YouTube, including illegal events that may be inaccessible to researchers working on the ground. Our team first learned of singing contests in Malaysia, for example, by stumbling across a YouTube video of a contest in Kuching, Sarawak that was published after Sarawak law had made such competitions illegal. These digital ecosystems may therefore provide unique access into the world of singing contests, and introduce researchers to contests and competition species that are not documented in academic literature. Just as the internet has expanded bird traders' access to information (Iqbal, 2015), it may also be the most useful platform for expanding our understanding of the bird trade and singing contests across the globe.

#### 4.4. Publication trends over time

Publications about the songbird trade and singing contests increased dramatically after the 2015 Asian Songbird Trade Crisis Summit across all five disciplines in our review. Consistent with the aforementioned patterns of research, Genetic, Field biology and Ecology studies increased the most, followed by research in Human Motives and Cultural Context and Trade Legislation and Enforcement. This hierarchy of research priorities was consistent across the Indo-Malay, Neotropic, and Palearctic ecoregions.

The Indo-Malay region set the curve for songbird trade research. As a region, it produced the first publications in three of our research categories and the greatest cumulative totals in every category for the thirty years this study surveyed. The first publications on Human Motives and Cultural Context, Education and Outreach, and Trade Legislation and Enforcement were all published out of this region in 1991. The first three publications in genetics, field biology and ecology all emerged in 1992 from the Indo-Malay, Afrotropic, and Neotropic regions.

The earliest published articles in our review focused on Genetic, Field, and Ecological studies, followed by research into Overall Drivers and Trade Legislation and Enforcement. These are also the disciplines where research increased the most after the 2015 Summit. This pattern is consistent across the Indo-Malay, Neotropic, and Palearctic ecoregions, which produced the three highest publication totals. Research on the songbird trade thus begins with questions that are focused on birds, followed shortly by questions about human culture and economic drivers, then policy measures and regulations designed to address those drivers. It is a pattern that shapes the overall publications as stated in Discussion Section 4.1 and the priorities we have used when conducting research on the songbird trade and its cultural facets.

## 5. Conclusions

This review has identified gaps in songbird trade research around human-centered areas of research, particularly in the area of Education and Outreach. Patterns in the research to date reflect a conservation approach that prioritizes wildlife over the human context around conservation issues. This is not to say that such human-centric studies do not exist, they certainly do, are included in this review, and are incredibly valuable. But overall, we still need more. Bird singing contests are deeply engrained in many cultures around the world, and where they put pressure on wild bird populations, conservationists must recognize that such practices are of great cultural, economic, and social value to those who participate.

In particular, education offers a grassroots approach to exploring and piloting new conservation strategies in collaboration with local stakeholders. Some proposed actions occur in the literature (Section 4.1) but there still isn't much scholarship acting on these suggestions or tying them together in a cohesive conservation strategy. Enacting change through education systems in countries with high rates of songbird trade could help focus these efforts. Education can involve outreach to direct stakeholders in the bird-keeping world, but it can also bring scholars to classrooms to understand how attitudes and behaviors towards traded songbirds first take shape in young people. An increasing number of environmental NGOs in countries like Indonesia, where bird-keeping is most popular (Gill, 2018; Jepson and Ladle, 2009), are engaging children in songbird conservation through classroom activities, field site visits, and first-hand encounters with native birds. Such programs are ideal laboratories in which to test interdisciplinary approaches to conservation and measure their potential to enhance environmental stewardship (Polfus et al., 2017). With ties to the community and to local government, an environmental education NGO 'can "translate" environmental information from national and international discourse into local contexts, empowering people to "think globally, act locally"' (Nomura et al., 2003).

Working through education programs could also help conservationists adopt a community action framework for combating illegal wildlife trade and building incentives for people to support conservation. As ooney et al. (2017) suggest, enforcement becomes easier when communities are supported in their use of wildlife resources and instilled with a greater "sense of ownership" that motivates greater stewardship (ooney et al., 2017). There are few contexts better suited for instilling these values or teaching methods of sustainable coexistence with wildlife than in a classroom. Similarly, teaching conservation to young people and learning what influences their perceptions of nature can help illuminate how human-bird relationships take root early in life. Our review did not find any research on these kinds of outreach programs, so the stage is set for new research to explore their impact. They may hold new keys for how conservationists can address the threats of the songbird trade while preserving the cultural meaning and identities tied to its many practices.

### CRedit authorship contribution statement

**Benjamin H. Mirin:** Conceptualization, Methodology, Data curation, Investigation, Writing – original draft. **Holger Klinck:** Validation, Supervision, Writing – review & editing.

### Declaration of Competing Interest

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

### Acknowledgements

This research was a collaborative effort between multiple individuals in the Department of Natural Resources at Cornell University and the Center for Conservation Bioacoustics at the Cornell Lab of Ornithology. Special thanks are due to our Center's resident and affiliated graduate students (Dawn Parry, Marissa Garcia, Irina Tolkova, Isha Bopardikar, and Bobbi Estabrook) who helped us categorize ten percent of the papers in our review to help ensure objectivity in our study design. Thank you also to Dena Clink whose expertise in coding helped us produce our figures, and to the US Department of Education and the National Science Foundation for providing financial support during the execution of this study. This material is based upon work supported by the US Department of Education Foreign Language and Area Studies Fellowship under Grant No. P015B180109, and the National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-1650441. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

### Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.gecco.2021.e01812](https://doi.org/10.1016/j.gecco.2021.e01812).

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