Songbird SKI

Summary: Species Knowledge Initiative to Support CITES Decisions and Recommendations for Passeriformes

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↗ Javan Green Magpie (*Cissa thalassina*) © Andrew Owen

Summary

Species Knowledge Initiative to Support CITES Decisions and Recommendations for Passeriformes

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Cover photo: Chestnut-backed thrush (*Geokichla dohertyi*) © Simon Bruslund.

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Main collaborating organizations:

Over more than 47 years, the contributions of Species360 members have created the world's largest database on wildlife in human care. We strive to harness this wealth of data, combining it with other critical wildlife data repositories, to support the conservation of species, improve animal care, and advance science. It is our pleasure to present the Species Knowledge Initiative (SKI) on Songbirds to support the CITES decision-making process. We want to thank all our collaborators, the sponsor partners of the Species360's Conservation Science Alliance, and our +1200 members that made this work possible. We hope this information made openly available will advance the CITES Animals Committee's work. leadership, and conservation practitioners.

Jim Guenter - Species360 CEO

It is our pleasure to present the Species Knowledge Initiative to support CITES decisions on Songbirds. Providing this work to CITES is part of the University of Southern Denmark, SDU's wishes to work with the United Nations' 17 Sustainable Development Goals (SDGs) based on free, critical and independent research and education. The work presented here includes these three components by collaboration across departments (Department of Biology and Department of Mathematics and Computer Sciences). Based on a methodology published by our faculty in 2019, the SKI integrates data and expertise from NGOs, companies, public organizations and other educational and research institutions. At the same time, we are proud to have some of our students and interns as contributors. We believe that it is fundamental to provide students with opportunities for education in knowledge, skills and motivation to work with the challenges behind the UN's SDGs. We hope this is one of many future projects to support CITES and other UN Conventions.

Prof. Marianne Holmer
Dean of the Natural Sciences Faculty, University of Southern Denmark

As former President of the World Association of Zoos and Aquariums (WAZA), it is my pleasure to present the Songbirds SKI. We hope that by supporting the Species360 Conservation Science Alliance, the present work can aid CITES decisions to regulate international trade on this taxa. Furthermore, the Songbirds SKI is an essential step after the European Association of Zoos and Aquaria (EAZA) 'Silent Forest' conservation campaign. Through this songbird conservation campaign, we raised awareness and support for in situ measures directed at mitigating the severe impact of the caged bird trade on the status of an increasing number of Southeast Asian songbirds. The EAZA Songbird Taxon Advisory Group's (TAG), ongoing efforts to help fight against the songbird crisis in Southeast Asia, still dominates our TAG activities.

Prof. Theo B. Pagel
Director of Cologne Zoo, Past-President of WAZA

What is the Species Knowledge Initiative?

The Species Knowledge Initiative (SKI) integrates multiple data sources to quantify current species knowledge and track changes in knowledge levels. Using a landscape ecology perspective, the SKI methodology maps data from different knowledge areas to individual species using data-processing algorithms and open-data repositories.

The SKI works with partners across disciplines to standardize, visualize, and consolidate data for vertebrate species to support evidence-based decision-making by policymakers, management authorities, zoo and aquarium leadership, and conservation practitioners.

What is the Songbird SKI?

Songbirds (Passeriformes) are the first taxon to be mapped using the SKI methodology with the main objective of supporting the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), using the same criteria as outlined for sharks (Oegelund Nielsen et al. 2020). The SKI was originally developed to map demographic knowledge at the species level (Conde et al. 2019).

The Songbird SKI is a preliminary study that integrates information into a decision framework to identify species for which more research is needed on international trade impacts. The Songbird SKI is designed to contribute to CITES Decision 18.256 on songbird trade and conservation management, which was adopted at CoP18, as stated in AC31, Doc.30, paragraph 6. The Songbird SKI is led by Species360's Conservation Science Alliance and The University of Southern Denmark's Biology Department, and Interdisciplinary Centre on Population Dynamics (CPop).

As of May 2021, only 85 of 6,599 songbird species (1.3%) are regulated by CITES. There is little to no regulation for international songbird trade beyond CITES-listed species, regardless of legal protection in countries of origin. To close this gap and support the research to identify potential species to be listed under CITES to improve enforcement and regulation, we integrated data on: i) species conservation priorities, ii) management (with a focus on ex-situ management), iii) biology, iv) species use, v) ecological and evolutionary values, and vi) evidence on illegal wildlife trade. The Songbird SKI combines available information and relationships from 32 English-language data repositories (Table 1) for 6,599 extant songbird species and the data are openly available (Juergens et al. 2020).

The Songbird SKI covers six knowledge areas:

- Trade
- Extinction risk
- Conventions and treaties
- Management opportunities (with a focus on ex-situ interventions)
- Biological information
- Species intrinsic values

To assess species in international trade not yet listed in CITES, we used information from seizures from TRAFFIC WiTIS, USFWS LEMIS (Eskew et al. 2020), and a list of species kindly provided by UNODC World WISE, which includes CITES Annual Illegal Trade Reports. We also extracted records from the newly developed Songbirds in Trade Database (SiTDB).

More details on the Songbird SKI is presented in the Extended Information Document (Annex 1). Data sources across the six knowledge areas are shown in Table 1 Data sources and the data integration methodology are described here and supplementary data are available here. Data are openly available in the Species360 Conservation Science Alliance Open Data Portal.

↑ Red siskin (*Spinus cucullatus*) © Torben Weber/Basel Zoo

↑ Pet Nias hill myna (*Gracula robusta*) for sale on the streets of Gunungsitoli, Indonesia. © Simon Bruslund

Goals of the Songbird SKI

The goal of the Songbird SKI is to identify and rank species in terms of their prevalence in international wildlife trade in relation to their survival status *in situ* and to direct further research on the impacts of international trade. This is done by:

1. Providing an overview of international (regulated and unregulated) trade patterns for songbird species, with a particular focus on CITES-listed species and species in international trade (i.e. those with trade or seizure records or with evidence of international demand).

2. Identifying data gaps and opportunities for research and collaboration across six knowledge areas (Table 1).

3. Providing a framework to facilitate amendments to CITES listings by identifying species for which international trade may have a detrimental impact on species survival in the wild.

4. Providing a framework to identify CITES-listed species that may be susceptible to laundering as captive bred.

How can the Songbird SKI be used?

The SKI is a decision support tool that identifies priority species meeting set criteria for conservation action across knowledge areas. The framework also allows the identification of species for which data are lacking and which require further research (e.g. threatened species where specific trade impacts are unknown). The results are illustrated through data visualization to support decision making at the species level.

In the CITES context, the Songbird SKI can be used as a basic framework to:

- Assess the extent of international songbird trade.
- Prioritize non-CITES listed species for further research and to better inform CITES listing proposals, as needed.
- Obtain biological data for Non-Detrimental Findings.
- Identify species potentially laundered as captive bred.

Table 1. Sources of information and references used across six knowledge areas. Further details can be found in Juergens et al. 2021, see Annex 3.

Knowledge Area	Reference
1. Conventions & international treaties	
CITES (historical)	UNEP-WCMC (Comps.), Checklist of CITES species, Hist. CITES List. (2014)
CITES (2020)	UNEP, The Species+ Website, Nairobi, Kenya. Compiled by UNEP-WCMC, Cambridge, UK (2020)
Convention on Migratory Species (2020)	UNEP, The Species+ Website, Nairobi, Kenya. Compiled by UNEP-WCMC, Cambridge, UK (2020)
EU Wildlife Trade Regulations (2020)	UNEP, The Species+ Website, Nairobi, Kenya. Compiled by UNEP-WCMC, Cambridge, UK (2020)
List of birds of the European Union	Council Directive 2009/147/EC on the conservation of wild birds, Official Journal L 020, p. 7 (2009).
2. Trade and other uses	
CITES Trade Database (exports, imports, and volumes)	UNEP-WCMC CITES trade statistics derived from the CITES Trade Database, Cambridge, UK (2020).
Songbirds in Trade Database (SiTDB)	See Juergens et al. 2021, Annex 3.
Species recorded by the USFWS Law Enforcement Management Information System (LEMIS)	Eskew et al., United States wildlife and wildlife product imports from 2000–2014, Scientific Data 7 (2020) 1–8.
TRAFFIC Wildlife Trade Information System (WiTIS)	TRAFFIC, Passerine Incidents 2008–2020, Incident Dataset (2020).
Species list from seizures from UNODC World WISE Database (1999–2006, 2006–2018) including CITES Annual Illegal Trade Reports.	List of Songbirds Records in Seizures, kindly provided by the United Nations Office on Drugs and Crime (UNODC) from the World WISE database.
CITES List of Species Use in Traditional Medicine	CITES, AC18 Doc. 13.1., List of species traded for medicinal purposes (2002).
Quantitative Assessments of the Diversity and Levels of Threat to Birds Used in African Traditional Medicine	Williams et al., in: Alves, Rosa (Eds.), Anim. Tradit. Folk Med., Springer, Heidelberg (2013), 383–420.
IUNC Red List species mentioned as used in trade (domestic & international) only includes 7 confirmed sp.	IUCN, IUCN Red List of Threatened Species, Version 2019-1 (2019).
3. Extinction risk	
Species in Alliance for Zero Extinction and trigger sites	Alliance for Zero Extinction, 2018 Global AZE Map (2020).
Species assessed as Climate Change Vulnerable (IUCN SSC)	Foden et al., PLoS One. 8 (2013).
IUCN Red List Status	Handbook of the Birds of the World and BirdLife International, Version 4 (2019) and IUCN, IUCN Red List of Threatened Species, Version 2019-1 (2019).
Priority Species from the Asian Songbird Trade Summit	J.G.H. Lee, et al., Conservation Strategy for Southeast Asian Songbirds in Trade (2016).
4. Management opportunities	
Species in Zoos	Species360, Zoological Information Management System (ZIMS) (2020).
Species managed in EAZA Regional Collection Plan for Songbirds: 2018	D. Jeggo, T. Pagel, EAZA Passerine Taxon Advisory Group Regional Collection Plan for Songbirds, in: S. Bruslund (Ed.), 1st ed., Cologne & Heidelberg, 2018: Table 6, pp. 6 - 11
Species managed in EAZA Regional Collection Plan of the Passeriformes 2019	D. Jeggo, S. Bruslund, K. Traylor-Holzer, W. Van Lint, R. Van der Meer, Regional Collection Plan of the EAZA Passeriformes Taxon Advisory Group, Asian Songbirds – Edition One., 2019: Table 2, 8 – 17 pp
Species managed in AZA Species Survival Plans	M. Brauns, personal communication.
5. Biological information	
Median body mass, clutch size, and diet	R.S.C. Cooke, et al., Global trade-offs of functional redundancy and functional dispersion for birds and mammals, Glob. Ecol. Biogeogr. 28 (2019) 484–495.
Species with a Genome: Vertebrate Genome Project Database – VGP Phase I Genomes	K.-P. Koepfli, et al., The Genome 10K Community of Scientists, The Genome 10K Project: A Way Forward, Annu. Rev. Anim. Biosci. 3 (2015) 57–111.
Species with Genomes: Bird 10 000 Genomes (B10K) Project – Passeriformes	G. Zhang, Bird sequencing project takes off, Nature 52 (2015).
Species with sequences in GenBank	D.A. Benson, et. al, GenBank, Nucleic Acids Res. D1 (2017) D37–D42.
Species distribution in the IUCN Red List	IUCN, IUCN Red List of Threatened Species, Version 2019-1 (2019).
Demographic Species Knowledge Index (survival & fertility traits)	D.A. Conde et al. Data gaps and opportunities for comparative and conservation biology, PNAS, 116.19 (2019). See open data here.
Global Register of Migratory Species (GROMS)	K. Riede, The Global Register of Migratory Species Database, Landwirtschaftsverlag, Münster, 2001.
Species considered invasive in the Global Invasive Species Database	Invasive Species Specialist Group ISSG, The Global Invasive Species Database, Version 2015.1 (2015), accessed September 14, 2020.
Invasive species from the Alien Species in the EU and IAS of Union Concern	European Commission - Joint Research Centre, European Alien Species Information Network (EASIN) (2020).
Species occurrence data all records & observations only	GBIF Occurrence Download (2020).
6. Value	
Ecological distinctiveness of birds and mammals at the global scale	R.S.C. Cooke, et al., Ecological distinctiveness of birds and mammals at the global scale, Glob. Ecol. Conserv. 22 (2020) e00970
Evolutionary Distinctiveness – Birds	Zoological Society of London, EDGE of Existence, EDGE List Birds (2019).

Overview of internationally traded songbirds in the SKI

To date, only 85 songbird species and subspecies are listed on CITES. Using the Handbook of the Birds of the World (HBW)/Birdlife taxonomy, this amounts to 93 species (App. I: 12 spp., App. II: 77 spp., and App. III: 4 spp.).

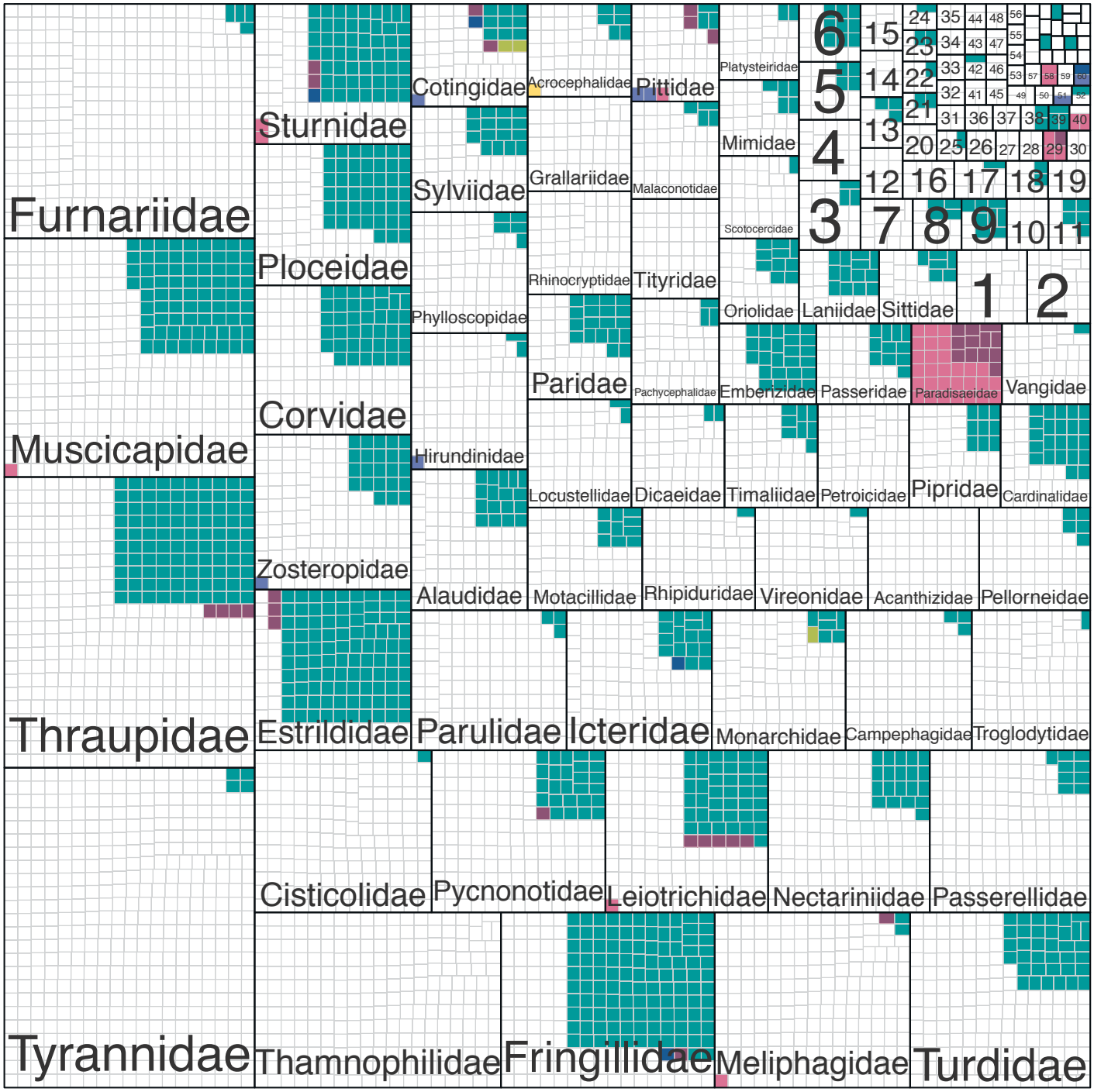
As of publication, the Songbird SKI contains data for all extant 6,599 songbird species, including 1,091 species that are CITES-listed or recorded in international trade (93 CITES-listed species, of which 43 are traded, and 998 non-CITES-listed species in trade).

Records from 1975 to 2018 in the CITES Trade Database show a 93% drop in trade after 2006. This drop has been attributed to the 2005 bird importation ban in Europe and the removal of 72 passerine species (some frequently traded) from CITES Appendix III in 2007. African countries were the leading exporters of wild-sourced individuals in 1975–2005 and 2006–2018. Importer countries were mainly European in 1975–2005, with almost half of 5.2 million individuals imported into Portugal and Belgium. In 2006–2018, South Africa was the leading importer with 84% of all 686 live individual records. For captive-bred individuals, the leading exporter in 1975–2005 was Taiwan (Province of China), and Japan was the leading importer. In 2006–2018, Taiwan (Province of China) and Cuba were the main exporters, and Japan and Mexico were the main importers.
In 2000–2014, 2.4 million live songbirds covering 360 species (including 19 CITES listed) were imported into the USA (USFWS LEMIS Database). Imports into the USA have gradually declined from 2000 to 2014, with a notable drop in 2006 for wild-caught individuals. Imports of captive-bred individuals peaked in 2002 and then gradually declined.

The SKI recorded 127 species in international seizure data from TRAFFIC WiTIS in 2008–2020 and a species list kindly provided by the UNODC World WISE Database (see Annex 1, Box 4), of which 24.4% (31 spp.) are CITES listed; the remainder are likely to be protected under national legislation. In TRAFFIC WiTIS, we recorded 650 international or domestic confiscation incidents of live or dead individuals (excluding derivatives) of CITES and non-CITES listed species across 43 countries. Since 2018, there has been a gradual increase in the number of songbird individuals seized in international illicit trade.

The Songbirds in Trade Database (SiTDB) identified 986 internationally traded songbird species from the peer-reviewed and gray literatures, expert opinion, and trade observations. Perceived levels of trade are classified as Extreme (3 spp.), High (26 spp.), Moderate (252 spp.), and Low (705 spp.), presenting a preliminary assessment of trade as a contributing threat to populations.

↑ Grosbeak starling (*Scissirostrum dubium*). © Simon Bruslund



CITES App.I (12) CITES App.II (77) CITES App.III (4) Traded internationally (1041)

Families: 1: Maluridae, 2: Dicruridae, 3: Artamidae, 4: Macrosphenidae, 5: Ptilonorhynchidae, 6: Viduidae, 7: Polioptilidae, 8: Aegithalidae, 9: Chloropseidae, 10: Conopophagidae, 11: Eurylaimidae, 12: Formicariidae, 13: Prunellidae, 14: Bernieridae, 15: Cinclosomatidae, 16: Melanocharitidae, 17: Remizidae, 18: Certhiidae, 19: Stenostiridae, 20: Climacteridae, 21: Calcariidae, 22: Calyptomenidae, 23: Regulidae, 24: Cinclidae, 25: Pomatostomidae, 26: Psophodidae, 27: Aegithinidae, 28: Callaeidae, 29: Cnemophilidae, 30: Hyliotidae, 31: Melanopareiidae, 32: Mitrospingidae, 33: Pardalotidae, 34: Phaenicophilidae, 35: Philepittidae, 36: Pnoepygidae, 37: Ptiliogonatidae, 38: Spindalidae, 39: Bombycillidae, 40: Dasyornithidae, 41: Falcunculidae, 42: Irenidae, 43: Modulatricidae, 44: Mohouidae, 45: Neosittidae, 46: Nicatoridae, 47: Oreoicidae, 48: Orthonychidae, 49: Paramythiidae, Families with fewer than three species are not numbered: Acanthisittidae, Atrichornithidae, Buphagidae, Calyptophilidae, Chaetopidae, Corcoracidae, Hylocitreidae, Machaerirhynchidae, Melampittidae, Menuridae, Picathartidae, Promeropidae, Teretistridae, Donacobiidae, Dulidae, Elachuridae, Eulacestomidae, Eupetidae, Hypocoliidae, Ifritidae, Nesospingidae, Notiomystidae, Panuridae, Peucedramidae, Pityriasidae, Platylophidae, Rhagologidae, Rhodinocichlidae, Sapayoidae, Urocynchramidae, Zeledoniidae.

↑ Figure 1. Treemap of internationally traded and/or CITES-listed songbirds. Each small square (pixel) represents one of 6,599 species ordered by taxonomic family (larger squares). The teal color indicates internationally traded species listed in five databases (SiTDB, USFWS LEMIS, TRAFFIC WiTIS, UNODC World WISE, and the CITES Trade Database, including species not listed in CITES but with trade records in the CITES Trade Database). Blue, red, and yellow indicates CITES-listed species, of which 43 are also in international trade. The white color indicates species not listed in CITES or the five databases.

Proposed applications of the Songbird SKI

Prioritizing species for further research and to support CITES listing amendments

Including a species under CITES Appendices requires assessments of i) trade, ii) species biology and iii) evidence that trade is detrimental or may harm species survival. The SKI proposes a basic framework to identify species in international trade that are not already listed on CITES and for which further assessments are needed.

The framework is based on the following criteria (*Figure 2*):

1. Species with records of international trade and listed under CITES.

2. Risk assessments based on similar biological criteria as those used by CITES:

a) High priority: Species assessed as globally threatened by the IUCN Red List.

b) Medium priority: Species not threatened but assessed as highly vulnerable to climate change by the IUCN Climate Change Specialist Group (Foden et al. 2013) and/or with decreasing population trends reported by the IUCN Red List.

c) Low priority: Species not identified in a) or b).

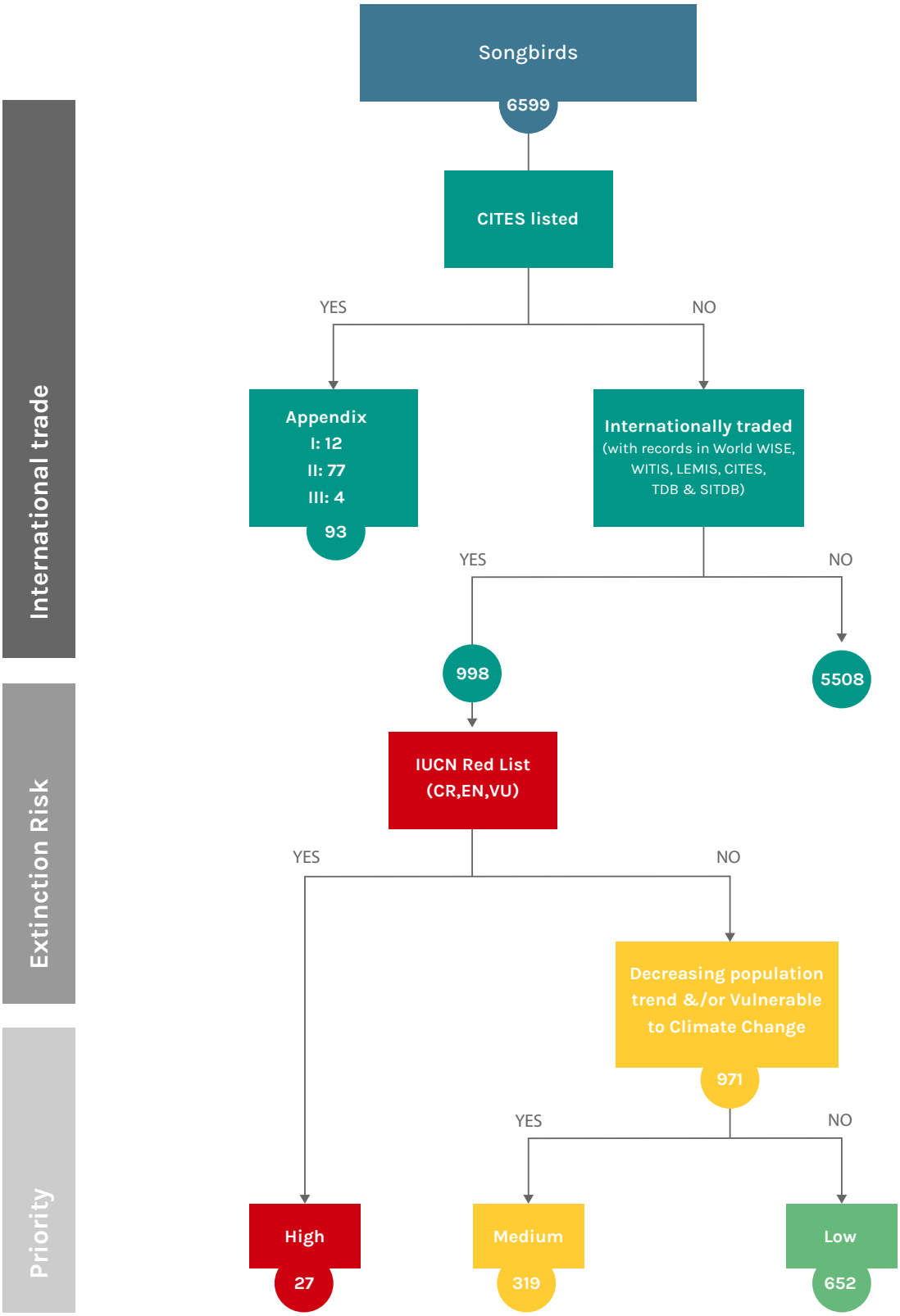
This provides a starting point to develop research initiatives. Among the 998 non-CITES-listed species in international trade, some families had a higher proportion of high and medium priority species, notably the laughingthrushes (*Leiotrichidae*; high priority: 12.2% and medium priority: 78%) and leafbirds (*Chloropseidae*; high priority: 25% and medium priority: 62.5%).

Based on the peer-reviewed literature, the SiTDB reported trade as a threat for 48.1% (13 spp.) of the 27 high priority species. However, for the categories of medium and low priority, the impacts of trade are unknown for 82.4% and 91.7% of species. A more in-depth review is needed for all prioritized species.

Global species threat assessments may not pinpoint all species for which international trade could be a threat, so national and regional species threat assessments are necessary. More research to assess international and domestic trade impacts is particularly needed for the 26 species in medium or low priority categories for which trade is reported as a threat in the SiTDB.

→ Hooded butcherbird (*Cracticus cassicus*) at a market in East Java, Indonesia © Simon Bruslund

Priority Species for research on the sustainability of international trade on wild populations



↑ Figure 2. Priority songbird species for research on the sustainability of international trade. Species numbers are according to the taxonomy of HBW and BirdLife International (2019).

Table 2. Songbird species traded as Appendix I captive-bred species (D), captive bred (C), captive born (F), or ranched (R) in the international commercial live trade (2006–2018).

Species	CITES Appendix	Breeding difficulty (SiTDB)	Zoo breeding program	Commercial or hobby breeding	CITES source code	Importer quantity	Exporter quantity
Lonchura oryzivora	II	easy	✓	✓	C	242,567	0
					F	0	65
Poephila cincta	II*	easy		✓	C	10	0
Garrulax canorus	II	normal	✓		C	20	0
Gubernatrix cristata	II	normal	✓		C	47	0
Leiothrix lutea	II	normal	✓	✓	C	23	0
Leucopsar rothschildi	I	normal	✓	✓	C	40	
					D	0	22
Paroaria coronata	II	normal	✓	✓	C	6	
					F	0	49
Pycnonotus zeylanicus	II	normal	✓	✓	C	3	0
Spinus cucullatus	I	normal	✓	✓	C	126	0
Spinus yarrellii	II	normal			C	30	29
Amandava formosa	II	hard			C	0	20
Cicinnurus regius	II	hard	✓		C	6	6
Gracula religiosa	II	hard	✓		C	1,941	0
					F	5	0
Hydrornis guajanus	II	hard	✓		C	1	1
Leiothrix argentauris	II	hard	✓		C	0	4
Paradisaea apoda	II	hard	✓		C	6	6
Paradisaea minor	II	hard			C	6	6
Rupicola peruvianus	II	hard			C	0	6
					F	0	4
					R	2	0
Rupicola rupicola	II	hard			F	3	0
Cephalopterus penduliger	III	challenging			C	0	4
Parotia carolae	II	challenging			C	300	0

Species potentially laundered as captive bred

CITES Parties have expressed concern about the deliberate misuse of captive source codes to launder wild-caught specimens as captive bred in international markets (CITES 2016). The Songbird SKI provides a preliminary framework that Parties may use to identify species of concern under Resolution 17.7 on captive breeding, based on breeding difficulty and levels of trade in captive-sourced individuals.

We assessed which CITES-listed species under CITES source codes for captive bred (source codes C and D), born in captivity (F), and ranched (R) were easy to breed and if the species or genus was held in a zoo. We identified 21 CITES-listed species (App. I: 2 spp. App. II: 18 spp., and App. III: 1 spp.) commercially traded as captive sourced in 2006–2018, all of which had records of zoo, commercial, or hobby breeding efforts (*Table 2*).

Of particular interest are species that are noted as "hard" or "challenging" to breed in captivity with transactions of trade under source code C (i.e., captive bred); this was the case for two species *Gracula religiosa* and *Parotia carolae* with 1,941 and 300 individuals recorded respectively from 2006-2018.

Data limitations and further research

The findings presented in the Songbird SKI reflect the underlying data sources. We have identified notable data gaps, biases, and assumptions, including:

- The Songbird SKI records a further 551 species as present only in domestic trade; these could have been traded internationally but were not reported in data sources.
- Global trade records are available only for CITES-listed species, which form a small subset of internationally traded species. Other international trade records are only available for the USA from USFWS LEMIS but we only had access to LEMIS data extracted from Eskew et al. (2020).
- Most published data sources and records we were able to access were from Southeast Asia, therefore data from other regions are incomplete.
- English-language sources dominated the data record.
- Many seizure records do not conclusively identify songbirds to the species level.
- Seizure data reflect illegal trade and enforcement effort, so species in illicit international trade with no seizures are not captured.

Further research is required to counter these data limitations and strengthen the Songbird SKI. The decision support frameworks also require fine-tuning for more robust application, as proposed below.

↑ Nias white-rumped Shama (*Kittacincla malabarica melanura*) at a market in Nias, Indonesia. © Simon Bruslund

Recommendations

For CITES Parties

Actions for high and medium priority species

Consider and assess legal and illegal trade levels and their legal and regulatory measures for the 27 high priority species identified. Parties with resources might want to prioritize this effort to include key species traded in higher volumes among the 319 medium priority species.

Use the Songbird SKI for national assessments

The SKI currently holds information at the global scale, such as species threat assessments and regulations. Further developing the SKI at national scales will be a great opportunity to expand its application and improve trade regulation and management. To enable this, Parties are encouraged to submit national-level information on native songbird species, such as national Red List assessments, legislation, quotas for domestic and international trade. Parties are also encouraged to use the SKI for species native to or traded within their country to identify species for further monitoring and assessment. We recommend that the CITES Secretariat coordinates this process.

Review species potentially being laundered as captive bred

Of the 11 species deemed "hard" or "challenging" to breed, two were traded in relatively high numbers under source code C. Their captive breeding and trade operations should be further assessed as potential species of concern under Resolution 17.7 on captive breeding to verify that no laundering may be taking place.

Future research priorities to develop the Songbird SKI

- Update the SiTDB and Songbird SKI with additional information, with emphasis on underrepresented regions and countries.
- Develop and test a comprehensive risk assessment framework based on the Songbird SKI to identify species which may warrant consideration by Parties for listing on CITES.
- Develop a detailed framework to identify species that may be deliberately misdeclared as captive bred. Further research is needed to characterize breeding difficulty, especially by commercial breeders. Trade levels under different source codes should also be interpreted in light of biological information for each species.
- Update the Songbird SKI with information at national levels when the legal framework is complete.
- Provide funding to support the Songbirds in Trade Database in its efforts to collect data on songbird trade in underrepresented regions or regions of trade importance.
- Ensure the SKI can be constantly updated to support policy makers and conservation practitioners. Currently, the SKI is static, meaning computational routines must be re-run to extract, standardize, and map the data. We are establishing a network of collaborators and seeking funding to update the SKI on an annual basis. This will allow us to flag changes in threat status, legislation, and new data to policy makers, conservation organizations, and scientists.

↑ Female ornate sunbirds (*Cinnyris ornatus*) in a bird market in Java, Indonesia. © Simon Bruslund

↑ Pair of Bali mynas (*Leucopsar rothschildi*) at Basel Zoo © Torben Weber

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References. See Annex 1

Annex 1. Extended Information Document

Annex 2. Essays on Live Songbird Trade and *Ex-situ* Conservation

Annex 3. Data Paper Juergens et al. 2021 Data in Brief and CITES submission

Annex 4. Data Files from Juergens et al. 2021 here or from the Species360 Open Data Portal.

Annex 5. Songbirds in Trade Database (SiTDB)

↑ Sumatran Laughingthrush (*Garrulax bicolor*) © Simon Bruslund

↗ Pair of straw-headed bulbuls (*Pycnonotus zeylanicus*) © Adobe Stock