

SUPPLEMENTAL MATERIAL

TO

The five million bird eggs in the world's museum collections are an invaluable and underused resource

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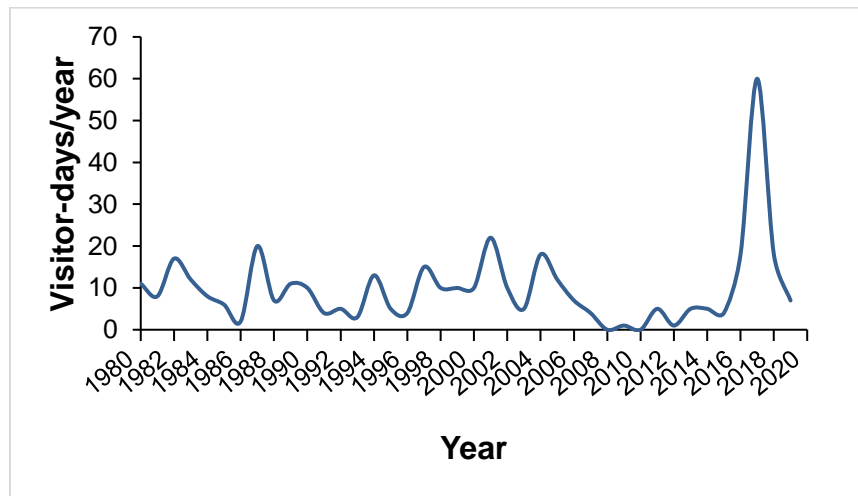
SUPPLEMENTAL MATERIAL FIGURE S1

Supplemental Material Figure S1. Visitation rates (visits/year) by scientists and the general public to the egg collection of the National Museums of Scotland (NMS) from 1980 to 2019. (A)

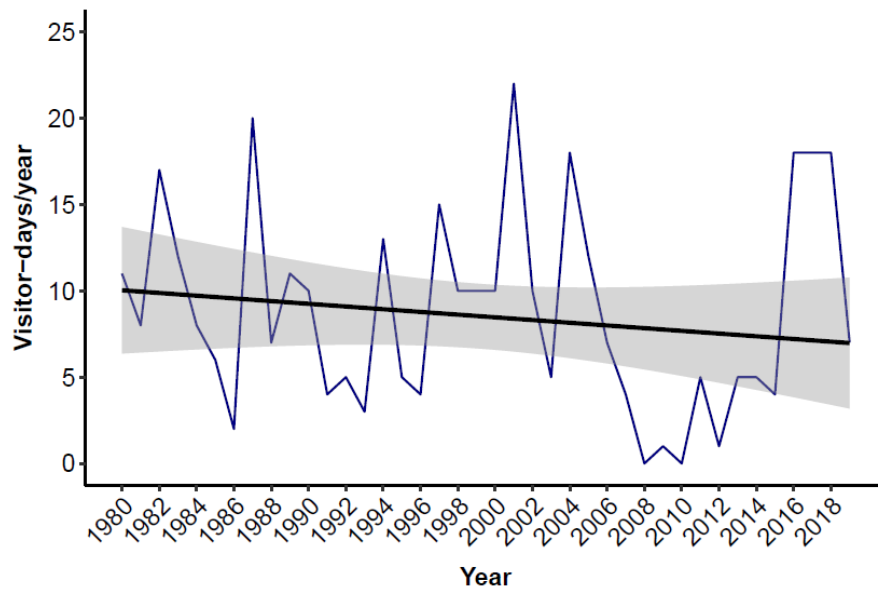
The spike in 2017 is related to multiple visits involving photography of eggs for a book. (B)

Trend (black line) and confidence interval (shaded in gray), excluding the 2017 spike.

(A)



(B)



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A BRIEF HISTORY OF EGG COLLECTIONS

With respect to western civilization, bird eggs were collected and commercially traded as early as the 1600s (Birkhead 2016), initially by amateurs, and later by natural history dealers for the hobby of having “cabinets of curiosities” or the “Wunderkammer” of Renaissance Europe. After 1800, naturalists and scientists also began to make comprehensive, systematic collections (e.g., Johann Natterer [1787-1843], John Drew Salmon [1802-1859] and Hermann Burmeister [1807-1892]) as part of government-sponsored expeditions (Barrow 2000, Purcell et al. 2008, Birkhead 2016, Cole 2016, McGhie 2017), but the pursuit remained largely in the hands of gentleman naturalists. By the 1830s, rare specimens of bird eggs or shells were sold and traded in “egg catalogues”, and were considered by some to be “more prized than money” (Secord 1994). Early naturalists collected eggs to describe the natural history of birds, and to use them in taxonomic and systematic studies (e.g., Ihering 1904). Egg collecting, both for ecological studies and for private collections, peaked from the 1890s to the 1930s (Figure 1) when several oology (from the Greek "oion", meaning “egg”) journals (e.g., *The Ornithologist and Oölogist* [1875-1893], *The Oologist* [1884-1938] and *The Oologists' Record* [1921-1969]) were published by editors with ties to both private and scientific communities. The most detailed book yet compiled on birds' eggs is the *Handbuch der Oologie*, which was published in 47 issues (3,615 printed pages; Schönwetter and Meise 1960–1992) describing egg sizes, colors, weights, and shapes. By the early 1900s, egg collecting began to fall out of favor because of its purported limited importance to taxonomy (but see Wetmore 1962, Grellet-Tinner et al. 2012) and rising concerns for species conservation (e.g., Grinnell 1906, McGhie 2017, and summarized in Purcell et al. 2008).

Concerns over the collecting of large quantities of eggs, such as those of Common Murre (*Uria aalge*) and Laysan Albatross (*Phoebastria immutabilis*), for food and other commercial products also caused public awareness (Cole 2016, McGhie 2017). As legislation successfully curtailed the actions of private collectors in many countries starting in the 1930s, the number of sets deposited by private collectors in museums declined dramatically (Figure 1).

Beginning around this period, egg collecting transformed from a hobby to primarily a scientific pursuit, and from an exchange business into a crime in the public sphere. Egg collecting was declared illegal by many governments and considered by many to be an environmental atrocity (Cole 2016, McGhie 2017). The 1930s-1940s also brought the development of *in situ* field studies on the breeding of birds (e.g., Moreau 1936, Baker 1938, Lack 1946), which led to a decrease in interest in egg collecting (Scharlemann 2001). Relatively little on the history, use, and curation of egg collections has been published in the last 50 years other than short overviews (e.g., Limbert 2003, Purcell et al. 2008, Hauber 2014).

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Supplemental Material Table S1. List of museums/institutions organized alphabetically by country name in English, and then by the size of the egg collection, with the number of egg sets, eggs and nests deposited, and source of information.

Museum	Abbreviation	City, Country	Egg sets*	Eggs**	Nests	Source***
Museo Argentino de Ciencias Naturales	MAC N	Buenos Aires, Argentina	1,000	1,000	800	M. Â. Marini, D. A. Lijtmaer, P. L. Tubaro
de la Peña, Martín (private collection)		Esperanza, Argentina	960		298	Martín de la Peña, collection owner, pers. comm. 10 June 2018
Instituto Miguel Lillo		San Miguel de Tucumán, Argentina		2,437	218	Walter Aveldaño, Sara Bertelli
Museo de La Plata	MLP	La Plata, Argentina	500			M. Â. Marini
Museo Provincial de Ciencias Naturales "Florentino Ameghino"		Santa Fé, Argentina	291			R. Corado
Museo de Ciencias Naturales y Antropológicas "Prof. Antonio Serrano"	MCNA	Entre Ríos, Argentina		220	31	G. Ibargoyen, collection manager, MCNA, pers. comm. 04 April 2018
Australian Museum	AM	Sydney, Australia	20,000		1,100	australianmuseum.net.au
South Australian Museum	SAMA	Adelaide, Australia		20,000	1,600	Gill 2006
Museum Victoria	NMV	Melbourne, Australia		20,000	600	Gill 2006
Australian National Wildlife Collection	ANWC	Canberra, Australia		13,190	330	Gill 2006
Queensland Museum	QM	Brisbane, Australia		5,150	300	Gill 2006
Western Australian Museum	WAM	Perth, Australia		4,850	1,150	Gill 2006
Queen Victoria Museum and Art Gallery	QVM	Launceston, Australia		2,500	850	Gill 2006
Macleay Museum	MMUS	Sydney, Australia		1,500	100	Gill 2006
Tasmanian Museum and Art Gallery	TMAG	Hobart, Australia		1,250	20	Gill 2006
Museum and Art Gallery of the Northern Territory	NTM	Darwin, Australia		60	20	Gill 2006

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Naturhistorisches Museum Wien	NMW	Vienna, Austria	13,000		1,000	Roselaar 2003
Biologie Zentrum des Oberösterreichisches Landesmuseums		Linz, Austria	3,500		500	eBEAC 2020
Steiermärkisches Landesmuseum Joanneum	LMJ	Graz, Austria	350		100	Roselaar 2003
Koninklijk Museum voor Midden-Afrika	KMMA/MR AC	Tervuren, Belgium	1,500		400	Roselaar 2003
Zemaljski Muzej Bosne i Hercegovina Sarajevo		Sarajevo, Bosna and Hercegovina		4,112	90	Roselaar 2003
Coleccion Bolivian de Fauna, Instituto de Ecología	CBF	Bolivia	34		13	R. Corado
Museu de Zoologia da USP	MZUSP	São Paulo, Brazil	2,200		2,000	Marini et al., in prep.
Museu Nacional	MN	Rio de Janeiro, Brazil	1,000	2,000	1,200	Marini et al., in prep.
Coleção Ornitológica Marcelo Bagno, Universidade de Brasília	COMB	Brasília, Brazil	531		726	Marini et al., in prep.
Museu Paraense Emilio Goeldi	MPEG	Belém, Brazil	330		160	Marini et al., in prep.
Fundação Zoobotânica do Rio Grande do Sul	MCNC	Porto Alegre, Brazil	100	100	130	Marini et al., in prep.
Museu de Ciências, Pontifícia Universidade Católica do Rio Grande do Sul	MCP	Porto Alegre, Brazil	113			Marini et al., in prep.
Museu do Ceará + Aquasis	MC	Fortaleza, Brazil	107			Marini et al., in prep.
National Museum of Natural History	NMNHS/N ZMS	Sofia, Bulgaria	260		12	Roselaar 2003
Royal Ontario Museum	ROM	Toronto, Canada	11,304			Kiff and Hough 1985
Royal Alberta Museum	RAM	Edmonton, Canada	14,000			L. Hall and R. Corado
National Museum of Canada		Ottawa, Canada	4,025			Kiff and Hough 1985
British Columbia Provincial Museum		Victoria, Canada	2,158			Kiff and Hough 1985
Cowan Vertebrate Museum		Vancouver, Canada	1,700			Kiff 1979
University of Saskatchewan		Saskatoon, Canada	750			Kiff and Hough 1985
Saskatchewan Museum of Natural History		Regina, Canada	417			Kiff 1979
Nova Scotia Museum		Halifax, Canada	377			Kiff and Hough 1985
Manitoba Museum of Man and Nature		Winnipeg, Canada	340			Kiff and Hough 1985

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Instituto de Investigaciones de Recursos Biológicos "Alexander von Humboldt"	IAvH-CJM	Vila de Leyva, Colombia	4,600			S. Cordoba-Cordoba
Instituto de Ciencias Naturales, Universidad Nacional de Colombia	ICN-MHN	Bogota, Colombia	100		200	Escalante 2005
Museo Nacional de Costa Rica		San Jose, Costa Rica	491		318	www.museocostarica.go.cr
Museo de Zoología Universidad de Costa Rica	MZUCR	San Jose, Costa Rica	205		544	L. Sandoval, professor, MZUCR, pers. comm. 26 April 2018
Zavod za Ornitologiju /Institute of Ornithology	ZOO	Zagreb, Croatia	557			Roselaar 2003
Instituto de Ecología y Sistemática	IES	La Havana, Cuba	695		29	Román and Wiley 2012
17 Cuban institutions		Cuba	337			Wiley et al. 2008
Národní Muzeum	NMP	Prague, Czech Republic	5,000			eBEAC 2020
Muzeum J. A. Komenského	MOSPPrerov	Prerov, Czech Republic	3,090	12,900		Chytil 2015; eBEAC 2020
Vlastivedne Muzeum v Olomouci		Olomouc, Czech Republic	273			Roselaar 2003
Muzeum Vychodních Czech		Hradec Králové, Czech Republic	50			Roselaar 2003
Zoologisk Museum	ZMUC	Copenhagen, Denmark	17,000			Roselaar 2003
Zoologia Muuseum	Tartu	Tartu, Estonia	3,000		100	Roselaar 2003
Colección de Ornitología, Museo de Historia Natural de El Salvador		San Salvador, El Salvador		27	26	L. Hall
Finnish Museum of Natural History	ZMUH	Helsinki, Finland	31,000		800	Roselaar 2003
University of Turku Zoological Museum	MZT	Turku, Finland	1,500			eBEAC 2020
Muséum d'Histoire Naturelle de Nantes	MHNNT	Nantes, France	8,757		124	eBEAC 2020
Muséum National d'Histoire Naturelle	MNHN	Paris, France	5,000			Roselaar 2003
Musée zoologique de l'Université Louis Pasteur et de la Ville de Strasbourg	MZS	Strasbourg, France	2,023		602	eBEAC 2020; M.-D. Wandhammer, collection manager, MZS, pers. comm. XX May 2018
Muséum d'Histoire Naturelle de Toulouse	MHNT	Toulouse, France		5,300		Roselaar 2003

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Musée Henri Dupuis		Saint-Omer, France	1,009		3	eBEAC 2020
Musée des Confluences		Lyon, France	713		150	eBEAC 2020
Muséum d'Histoire Naturelle de Grenoble	MHNGr	Grenoble, France		830	30	Roselaar 2003
Musée municipal de Semur-en-Auxois		Semur-en-Auxois, France	50			eBEAC 2020
Zoologisches Forschungsinstitut und Museum Alexander Koenig	ZFMK	Bonn, Germany	60,000		1,700	Beck 2018
Museum für Naturkunde	ZMB or ISZ	Berlin, Germany	50,000		1,500	S. Frahnert
Zentralmagazin Naturwissenschaftlicher Sammlungen, Martin Luther University Halle-Wittenberg	MLUH	Halle (Saale), Germany	21,000		100	F. Steinheimer
Staatliches Naturhistorisches Museum	SNMB	Braunschweig, Germany	20,000		900	C. Kamcke, collection manager zoology, SNMB, pers. comm. 27 June 2018
Senckenberg Naturhistorische Sammlungen	SMTD	Dresden, Germany	15,000		950	www.senckenberg.de
Niedersächsisches Landesmuseum	NLMH	Hannover, Germany		35,000	133	C. Schilling, curator biosciences, NLMH, pers. comm. 5 June 2018
Staatliches Museum für Naturkunde	SMNS	Stuttgart, Germany	10,000	50,000	1,000	Roselaar 2003, Beck 2018
LWL-Museum für Naturkunde	LWLMN	Münster, Germany	10,000		100	J. O. Kriegs, head of museum, LWLMN, pers. comm. 5 June 2018
Museum Heineanum	MHH	Halberstadt, Germany	7,400			R. Becker, head of museum, MHH, pers. comm. 6 June 2018
Zoologische Sammlung, Technische Universität		Darmstadt, Germany	7,000			Beck 2018
Deutsches Meeresmuseum	DMM	Stralsund, Germany	6,000			Beck 2018
Forschungsinstitut und Naturmuseum Senckenberg	SMF	Frankfurt am Main, Germany	5,050			www.senckenberg.de
Naturkundemuseum Leipzig	NKML	Leipzig, Germany	5,073			Beck 2018
Centrum für Naturkunde der Universität Hamburg	CeNak	Hamburg, Germany		14,212		C. Bracker, collection manager, CeNak, pers. comm. 5 June 2018
Naturkundemuseum Potsdam		Potsdam, Germany		14,000		Beck 2018

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Naturhistorisches Museum Rudolstadt	NMR	Rudolstadt, Germany	4,500		40	eBEAC 2020
Naturkunde-Museum Coburg	NMC	Coburg, Germany	3,000			Roselaar 2003
Müritzzeum		Waren, Germany	4,115			Beck 2018
Übersee-Museum	ÜMB	Bremen, Germany	3,200		210	M. Stiller, head of zoology, ÜMB, pers. comm. 6 July 2018
Aquazoo Löbbecke Museum		Düsseldorf, Germany		8,000		Beck 2018
Niedersächsisches Landesmuseum Natur und Mensch		Oldenburg, Germany		7,900	260	Beck 2018
Senckenberg Museum für Naturkunde		Görlitz, Germany	2,263			www.senckenberg.de
Zoologisches Museum der Universität Greifswald		Greifswald, Germany	2,161		125	https://zoologie.uni-greifswald.de/
Museum für Naturkunde	MfNC	Chemnitz, Germany	1,350			Beck 2018
Museum für Naturkunde	MfNM	Magdeburg, Germany	1,200			Roselaar 2003
Museum der Westlausitz		Kamenz, Germany	1,200			Beck 2018
Museum am Schölerberg		Osnabrück, Germany		3,500		N. Niedernostheide, head of museum, Mus. Schöerberg, pers. comm. 5 June 2018
Landesmuseum Wiesbaden	MWHN	Wiesbaden, Germany	1,030	1,564		http://www.mwnh.de/samm042.htm 1
Pfalzmuseum für Naturkunde Pollichia	PMN	Bad Dürkheim, Germany		3,000	250	F. Wieland, head of museum, pers. comm. 11 July 2018
Naturhistorisches Museum Mainz	NHMMZ	Mainz, Germany	931	2,116	342	Beck 2018; C. Renker, head of collection, pers. comm. 18 June 2018
Zoologische Staatssammlung	ZSM	München, Germany		2,500	40	M. Unsöld, head of bird collection ZSM, pers. comm. 9 July 2018
Naturwissenschaftliches Museum		Flensburg, Germany		2,500		Beck 2018
Phyletisches Museum Jena	PMJ	Jena, Germany	671	1,273	53	D. von Knorre, former curator, PMJ, pers. comm. 21 June 2018
Staatliches Museum für Naturkunde	SMNK	Karlsruhe, Germany	600			Roselaar 2003
Naturkundemuseum Erfurt		Erfurt, Germany	545		208	Beck 2018

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Zoologische Sammlung der Universität Tübingen	ZST	Tübingen, Germany	500			Roselaar 2003
Zoologische Sammlung der Universität Siegen		Siegen, Germany		1,022		Beck 2018
Pfalzmuseum für Naturkunde Pollichia	PMN	Bad Dürkheim, Germany	300		50	Roselaar 2003
Zoologische Sammlung der Universität Göttingen	ZIMG	Göttingen, Germany		1,000		Beck 2018
Naturkundliches Museum Mauritianum	MMA	Altenburg, Germany	200			Roselaar 2003
Naturkunde-Museum Bamberg	NK MBA	Bamberg, Germany		552	112	Beck 2018
Institut für Vogelforschung 'Vogelwarte Helgoland'	IfV	Wilhelmshaven, Germany		270	120	Roselaar 2003
Zentrum für Biodokumentation des Saarlandes		Schiffweiler, Germany		149		Beck 2018
Zoological Museum	ZMUA	Athens, Greece		500	100	Roselaar 2003
Hungarian egg collections		Hungary	23,945		120	Pereszlényi et al. 2019, Roselaar 2003
Icelandic Institute of Natural History	IMNH /NHMR	Reykjavik, Iceland	2,600		650	Roselaar 2003
Tel-Aviv University Zoological Museum	TAUZM	Tel Aviv, Israel	1,400		600	eBEAC 2020
Museo Civico di Storia Naturale	MSNM	Milan, Italy	2,500			Roselaar 2003
Museo di Storia Naturale e del Territorio	MSNTP	Pisa, Italy		1,100	800	Roselaar 2003
Museo Zoologico de 'La Specola'	MZUF	Florence, Italy	350		100	Roselaar 2003
Museo di Zoologia		Padua, Italy	340		98	Roselaar 2003
Museo Civico de Storia di Carmagnola (MCCI)	MCCI	Carmagnola, Italy	292		73	eBEAC 2020
Museo di Storia Naturale di Terrasini		Terrasini, Italy	222		554	eBEAC 2020
Museo dell'Istituto Nazionale per la Fauna Selvatica	INFS	Bologna, Italy	150			Roselaar 2003
Museo Ornitologico di Scienze Naturali del Comune di Ravenna		Ravenna, Italy		330	91	Roselaar 2003
Museo Civico di Storia Naturale 'Giacomo Doria'	MSNG	Genova, Italy	100		100	Roselaar 2003
Yamashina Institute of Ornithology		Chiba, Japan	175		96	decochan.net/

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Kaunas Zoological Museum		Kaunas, Lithuania	872		113	Roselaar 2003
Musée National d'Histoire Naturelle du Luxembourg	MNHNL	Luxembourg	300		240	eBEAC 2020
Colección Nacional de Aves (UNAM)	CNAV	Cidade do Mexico, Mexico	150		100	www.ibiologia.unam.mx/cnav/
Colección Ornitológica del Centro de Investigaciones Biológicas (COCIB-UAEM), Facultad de Biología, Universidad Autónoma del Estado de Morelos		Mexico		86	86	L. Hall
Museo de de Zoología “Alfonso L. Herrera”, Facultad de Ciencias, UNAM		Mexico		27	25	L. Hall
Otago Museum	OM	Dunedin, New Zealand		3,800	70	Gill 2006
Auckland Museum	AIM	Auckland, New Zealand		3,510	140	Gill 2006
Museum of New Zealand	MNZ	Wellington, New Zealand		3,190	10	Gill 2006
Canterbury Museum	CM	Christchurch, New Zealand		800	100	Gill 2006
Zoologisk Museum	ZMUO	Oslo, Norway	6,500			Roselaar 2003
Universitetsmuseet i Bergen	ZMUB	Bergen, Norway	2,659			eBEAC 2020
Zoologisk Museum	ZMBN	Bergen, Norway	2,554			Roselaar 2003
Universitets Museet i Tromsø	TSZV	Tromsø, Norway	1,700			eBEAC 2020
Museum of Natural History and Archaeology		Trondheim, Norway		400	50	Roselaar 2003
Zakład Zoologii Systematycznej i Doswiadczalnej (Institute of Systematics and Evolution of Animals)	ISEA	Krakow, Poland	2,900		300	Roselaar 2003
Muzeum Przyrodnicze	MPUW	Wroclaw, Poland	2,000			Roselaar 2003
Upper Silesian Museum		Bytom, Poland		3,821	234	Roselaar 2003
Muzeum Okregowe		Czestochowa, Poland	567			eBEAC 2020
museum at Jelenia Góra		Jelenia Góra, Poland		541	30	Roselaar 2003
museum at Bialywieza		Bialywieza, Poland		335		Roselaar 2003

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Museu de História Natural–Museu Zoológico, Faculdade de Ciências e Tecnologia da Universidade de Coimbra	MZCoimbra	Coimbra, Portugal	1,129		238	Roselaar 2003
Muzeul de Istorie Naturala / Museum of Natural History ‘Grigore Antipa of Natural History ‘Grigore Antipa	GAMNH/M GAB	Bucharest, Romania	1,200		250	Roselaar 2003
Lyzeum		Reghin, Romania		2,217	471	Roselaar 2003
Muzeul Brukenthal – Muzeul de Istorie Naturala	MBS	Sibiu, Romania		1,575		Roselaar 2003
Cris-River Regional Museum	CRRM	Oradea, Romania	500			Beczy 1971
Zoologicheskii Institut	ZISP	Saint Petersburg, Russia	20,000		20,000	Roselaar 2003; Obs.: nests with eggs
Zoological Museum	ZMMU	Moscow, Russia	10,000		4,000	Roselaar 2003; Tomkovich et al. 2015
Zoological Museum	ZM SPBU	Saint Petersburg, Russia	8,000		8,000	zmmu.msu.ru
Darwin Museum	SDM	Moscow, Russia	1,000		150	Roselaar 2003
Moscow State University		Moscow, Russia	400			Roselaar 2003
National Museum of Republic of Tatarstan		Kazan, Russia		437	10	Novikova 2015
Oological bank of cuckoos		Russia		294		Bachurin and Mesheriagina 2015
Krasnoyarsk Regional Museum		Krasnoyarsk, Russia		140		Gavrilov 2015; Obs.: "eggs and nests"
Zoological museum of Tyumen State University		Tyumen, Russia		100		Khalitov and Lupinos 2015; Obs.: "eggs and nests"
Institute for Nature Conservation of Vojvodina Province		Novi Sad, Serbia	405		50	eBEAC 2020
Vychodoslovenské Muzéum Kosice	VSM	Kosice, Slovakia	1,200			Roselaar 2003
Sarisske Museum	SMB	Bardejov, Slovakia	800			Roselaar 2003
Ditsong National Museum of Natural History		Pretoria, South Africa	9,221		250	www.ditsong.org.za
Durban Natural Science Museum		Durban, South Africa	1,770		30	www.durban.gov.za
Estación Biologica de Doñana	EBD	Seville, Spain	1,344			Roselaar 2003
Museo Nacional de Ciencias Naturales	MNCN	Madrid, Spain	161		247	eBEAC 2020

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Naturhistoriska Riksmuseet	NRM	Stockholm, Sweden	29,000		500	eBEAC 2020
Naturhistoriska Museet	GNM	Gothenburg, Sweden	10,000			Roselaar 2003
Zoologisk Museum	ZMUL	Lund, Sweden	8,393		400	Roselaar 2003
Ornithological Museum		Jönköping, Sweden		2,580		Roselaar 2003
Muséum d'Histoire Naturelle de Genève	MHNG	Geneva, Switzerland	18,562		516	A. Cibois and L. Vallotton
Naturhistorisches Museum Bern	NMBE	Bern, Switzerland	8,955		608	Roselaar 2003
Muséum d'Histoire Naturelle de Neuchâtel	MHNNL	Neuchâtel, Switzerland		6,000	200	Roselaar 2003
Musée de Zoologie	MZL	Lausanne, Switzerland		3,000		Roselaar 2003
Zoologisches Museum der Universität Zürich-Irchel	ZMUZ	Zürich, Switzerland	800			Roselaar 2003
Muséum d'Histoire Naturelle de Fribourg	MHNF	Fribourg, Switzerland	515		130	Roselaar 2003
Naturalis, Nationaal Natuurhistorisch Museum	RMNH	Leiden, The Netherlands	39,459		5,000	P. Kamminga
Zoölogisch Museum	ZMA	Amsterdam, The Netherlands	5,000			Roselaar 2003
Natuurmuseum Rotterdam	NMR	Rotterdam, The Netherlands	500			Roselaar 2003
Natuurhistorisch Museum Maastricht	NHMM	Maastricht, The Netherlands		1,370		Roselaar 2003
Fries Natuurmuseum	FNM	Leeuwarden, The Netherlands		1,000		Roselaar 2003
The Natural History Museum	BMNH/NHM	Tring, UK	450,000		4,000	Roselaar 2003; Russell et al. 2013
National Museums Scotland	NMS	Edinburgh, UK	45,000		400	eBEAC 2020
Liverpool Museum	LivCM	Liverpool, UK	12,000		180	Roselaar 2003
Oxfordshire County Council Museums		Witney, UK	12,000	300		Roselaar 2003
The Manchester Museum	MANCH	Manchester, UK	11,527		271	eBEAC 2020
Glasgow Art Gallery and Museum (Univ. of Glasgow)	GLAMG	Glasgow, UK	10,000		1,450	Russell et al. 2013; eBEAC 2020
Great North Museum: Hancock	NEWHM	Newcastle, UK	10,000		1,000	Roselaar 2003
Booth Museum of Natural History	BMB	Brighton, UK	10,000		262	Roselaar 2003; eBEAC 2020

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National Museum and Galleries of Wales	NMWC	Cardiff, UK	8,000		200	Roselaar 2003
University Museum of Zoology	CUMZ	Cambridge, UK	8,000			Roselaar 2003
Bolton Museums	BOLMG	Bolton, UK	5,500		180	Roselaar 2003
Tullie House Museum and Art Gallery		Carlisle, UK	3,500			Roselaar 2003
Herbert Art Gallery and Museum	HAGM	Coventry, UK		9,500		Roselaar 2003
Leeds Museum Discovery Centre	LEEDM	Leeds, UK	3,000			Roselaar 2003
Bristol Museums and Art Gallery Service	BCMAG	Bristol, UK	2,400		300	Roselaar 2003
Saffron Walden Museum	SWM	Essex, UK		6,540		Roselaar 2003
Oxford University Museum of Natural History	OUM	Oxford, UK	2,000			Roselaar 2003
Royal Albert Memorial Museum and Art Gallery	EXEMS / RAMM	Exeter, UK	1,500		100	eBEAC 2020
Birmingham Museum and Art Gallery	BMAG	Birmingham, UK	1,000			Roselaar 2003
Shropshire County Museum Service	SHRCM	Ludlow, UK		3,000		Roselaar 2003
Yorkshire Museum		York, UK		2,000		Roselaar 2003
Southend Central Museum	SOUMS	Southend-on-Sea, UK	300			Roselaar 2003
Swansea Museum		Swansea, UK	200			Roselaar 2003
National Museum of Natural History	ZIK or ZMA	Kiev, Ukraine	1,200		600	eBEAC 2020
Benedykt Dybowski Zoological Museum of the Ivan Franko Lviv National University		Lvov, Ukraine	476		55	Roselaar 2003
Museo Nacional de Historia Natural	MNHN	Montevideo, Uruguay	39		15	Jones, W., MNHN, pers. comm., 13 April 2018
Western Foundation of Vertebrate Zoology	WFVZ	Camarillo, CA, USA	275,000		20,000	www.wfvz.org; L. Hall and R. Corado
Delaware Museum of Natural History	DMNH	Wilmington, DE, USA	36,773			Kiff and Hough 1985
National Museum of Natural History	NMNH	Washington, D.C., USA	31,329		7000	Kiff and Hough 1985; Kiff 1979
San Bernardino County Museum		Redlands, CA, USA	28,042			Kiff and Hough 1985
Field Museum of Natural History	FMNH	Chicago, IL, USA	20,947			J. Bates

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American Museum of Natural History	AMNH	New York, NY, USA	16,679		4,320	P. Sweet
Museum of Vertebrate Zoology Peabody Museum of Natural History, Yale University	MVZ YPM	Berkeley, CA, USA New Haven, CT, USA	13,700 13,374		1,120	mvz.berkeley.edu https://collections.peabody.yale.edu/search/ ; K. Zyskowski
University of Wisconsin-Green Bay		Green Bay, WI, USA	12,000			L. Hall institution website review, 2014
Museum of Comparative Zoology, Harvard University	MCZ	Cambridge, MA, USA	11,600			L. Hall institution website review, 2014
Florida Museum of Natural History	FMNH	Gainesville, FL, USA	10,400			www.floridamuseum.ufl.edu
Santa Barbara Museum of Natural History****	SBMNH	Santa Barbara, CA, USA	9,998			Kiff and Hough 1985; R. Corado
Carnegie Museum of Natural History	CM	Pittsburgh, PA, USA	9,930			L. Hall institution website review, 2014
California Academy of Sciences	CAS	San Francisco, CA, USA	7,556			http://researcharchive.calacademy.org
University of Massachusetts		Amherst, MA, USA	6,101			Kiff and Hough 1985
New York State Museum	NYSM	Albany, NY, USA	6,000			www.nysm.nysed.gov
Clemson University		Clemson, SC, USA	5,366			Kiff and Hough 1985
Reading Public Museum and Art Gallery		Reading, PA, USA	5,000			Kiff 1979
Burke Memorial Washington State Museum		Seattle, WA, USA	4,634			http://www.burkemuseum.org
Puget Sound Museum of Natural History (now: Slater Museum of Natural History)		Tacoma, WA, USA	4,600		1,300	http://pugetsound.ed
Illinois State Museum	ISM	Springfield, IL, USA	4,500			Kiff 1979
Ohio State University	OSUM	Columbus, OH, USA	4,475			Kiff and Hough 1985
Denver Museum of Natural History****		Denver, CO, USA	4,467			Kiff and Hough 1985; R. Corado
University of Michigan Museum of Zoology	UMMZ	Ann Arbor, MI, USA	4,250		540	lsa.umich.edu
Snyder, Barton, M. (private collection)		Allentown, PA, USA	3,890			Kiff and Hough 1985

SUPPLEMENTAL MATERIAL

Charleston Museum		Charleston, SC, USA	3,882			Kiff and Hough 1985
Stovall Museum of Science and History (now: Sam Noble Oklahoma Museum of Natural History)		Norman, OK, USA	3,800		490	https://samnoblemuseum.ou.edu/collections-and-research
Welder Wildlife Foundation		Sinton, TX, USA	3,310			Kiff and Hough 1985
Tulsa Zoological Park		Tulsa, OK, USA	2,696			Kiff and Hough 1985
Brigham Young University	BYU	Provo, UT, USA	2,493			Kiff and Hough 1985
Neotropical Ornithological Foundation		Tucson, AZ, USA	2,266			Kiff 1979
University of Nevada - Reno	UNR	Reno, NV, USA	2,181			Kiff and Hough 1985
Milwaukee Public Museum	MPM	Milwaukee, WI, USA	2,161			Kiff and Hough 1985
Virginia Polytechnic Institute and University		Blacksburg, VA, USA	2,100			Kiff and Hough 1985
Anniston Museum of Natural History		Anniston, AL, USA	2,050			Kiff 1979
Cleveland Museum of Natural History	CMNH	Cleveland, OH, USA	2,027			Kiff and Hough 1985
Museum of Natural History - University of Kansas		Lawrence, KS, USA	1,835			Kiff and Hough 1985
Cornell University	CUMV	Ithaca, NY, USA	1,800		730	Kiff 1979; www.cumv.cornell.edu
University of Arkansas	UAFMC	Fayetteville, AR, USA	1,678			Kiff 1979
Science Museum		Springfield, MA, USA	1,612			Kiff and Hough 1985
University of Colorado Museum of Natural History	UCM	Boulder, CO, USA	1,412			Kiff and Hough 1985
James Ford Bell Museum of Natural History - Parmelle, Dr. David Private Collection		Minneapolis, MN, USA	1,372			Kiff and Hough 1985
State Museum, University of Nebraska		Lincoln, NE, USA	1,358			Kiff and Hough 1985
Chicago Academy of Sciences	CHAS	Chicago, IL, USA	1,186			Kiff and Hough 1985
Corpus Christi Museum of Science and History		Corpus Christi, TX, USA	1,135			Kiff and Hough 1985

SUPPLEMENTAL MATERIAL

University of Iowa Museum of Natural History	SUI	Iowa City, IA, USA	1,000			Kiff 1979
Fairbanks Museum		St. Johnsbury, VT, USA	1,000			Kiff 1979
Museum of Natural History, University of Oregon		Eugene, OR, USA	1,000			Kiff 1979
University of Arizona Museum of Natural History	UAZ	Tucson, AZ, USA	945			Kiff and Hough 1985
Boston Museum of Science		Boston, MA, USA	925			Kiff and Hough 1985
University of Connecticut, Biodiversity Research Collections	UCONN	Storrs, CT, USA	800			Kiff 1979
University of Wisconsin-Madison		Madison, WI, USA	800			Kiff 1979
Museum of Natural History, University of Illinois at Urbana-Champaign		Urbana, IL, USA	719			Kiff and Hough 1985
University of New Mexico		Albuquerque, NM, USA	717			Kiff and Hough 1985
William Penn Memorial Museum		Harrisburg, PA, USA	701			Kiff and Hough 1985
University of the South		Sewanee, TN, USA	698			Kiff and Hough 1985
Humboldt State University	HSU	Arcata, CA, USA	674			Kiff and Hough 1985
Joseph Moore Museum, Earlham College		Richmond, IN, USA	673			Kiff and Hough 1985
Buffalo Museum of Science		Buffalo, NY, USA	615			Kiff and Hough 1985
University of Minnesota		Minneapolis, MN, USA	600			Mearns and Mearns 1998
Adams State College		Alamosa, CO, USA	566			Kiff and Hough 1985
Strecker Museum (now: Mayborn Museum)		Waco, TX, USA		1,623	286	http://baylor.edu/mayborn
Bates College		Lewiston, ME, USA	500			Kiff 1979
More, Robert L., Sr. (private collection)		Vernon, TX, USA	500			Kiff 1979
Rochester Museum and Science Center	RMSC	Rochester, NY, USA	500			Kiff 1979
University of Miami		Coral Gables, FL, USA	500			Kiff 1979
Pacific Union College		Angwin, CA, USA	500			Kiff and Hough 1985

SUPPLEMENTAL MATERIAL

Moore Laboratory of Zoology, Occidental College	MLZ	Los Angeles, CA, USA	483			Kiff and Hough 1985
University of Texas at El Paso Biodiversity Collections	UTEP	El Paso, TX, USA	470			Kiff and Hough 1985
East Tennessee State University		Johnson City, TN, USA	450			Kiff 1979
University of Wisconsin-Stevens Point		Stevens Point, WI, USA	425			Kiff and Hough 1985
Coe College		Cedar Rapids, IA, USA	400			Kiff 1979
Mississippi Museum of Natural Science	MMNS	Jackson, MS, USA	392			Kiff and Hough 1985
Peabody Museum of Salem [now: Peabody Essex Museum]	PEM	Salem, MA, USA	392			K. Zyskowski
Idaho State University		Pocatello, ID, USA	385			Kiff 1979
Florida State University		Tallahassee, FL, USA	362			Kiff and Hough 1985
University of Maine		Orono, ME, USA	360			Kiff 1979
Putnam Museum		Davenport, IA, USA	341			Kiff and Hough 1985
University of Tennessee at Martin		Martin, TN, USA	340			Kiff 1979
Museum of Zoology, Miami University		Oxford, OH, USA	316			Kiff and Hough 1985
Michigan State University Museum	MSUM	East Lansing, MI, USA	300			Kiff 1979
Mississippi State University		Mississippi State, MS, USA	300			Kiff 1979
Worcester Natural History Society		Worcester, MA, USA	300			Kiff 1979
Fort Worth Museum of Science and History		Fort Worth, TX, USA	295			Kiff 1979
California State University	CSU	Los Angeles, CA, USA	290			Kiff 1979
Stephen F. Austin State University		Nacogdoches, TX, USA	280			Kiff 1979
Walla Walla College		College Place, WA, USA	277			Kiff and Hough 1985

SUPPLEMENTAL MATERIAL

Cincinnati Museum of Natural History		Cincinnati, OH, USA	250			Kiff 1979
Colorado State University		Fort Collins, CO, USA	230			Kiff 1979
Alabama Museum of Natural History		Tuscaloosa, AL, USA	200			Kiff 1979
Wagner Free Institute of Science		Philadelphia, PA, USA	200			Kiff 1979
Minot State College		Minot, ND, USA	196			Kiff and Hough 1985
South Dakota State University		Brookings, SD, USA	189			Kiff and Hough 1985
Museo de la Estación Biológica de Rancho Grande		Maracay, Venezuela		180	99	Bisbal 2000
Colección Ornitológica Phelps	COP	Caracas, Venezuela		115	215	M. Lentino, collection manager, COP, pers. comm. 26 April 2018
Museo de Historia Natural, Universidad La Salle		Caracas, Venezuela	36		54	V. Malave, collection manager, MHN, pers. comm.
Institute for Protection of Nature of Serbia		Novi Sad, Yugoslavia	405		50	Roselaar 2003
Natural History Museum of Zimbabwe		Bulawayo, Zimbabwe	8,000			Mearns and Mearns 1998
TOTAL			1,866,583	306,395	115,284	
<p>* Egg set = a collection unit with its own registration number or/and clear separation from other such units. These sets may contain an entire clutch, several eggs from more than one clutch or incomplete clutches. Thus, generally the number of egg sets is higher than the number of egg clutches but lower than the count of individual eggs.</p> <p>** We report the number of eggs only when the number of egg sets is not available, or when there are eggs not assigned to egg sets. In order to rank the collections by the size of their collections by country, we considered that on average three eggs represent one egg set.</p> <p>*** Complete references in Supplemental Material Table S3.</p> <p>**** Numbers refer to values reported by Kiff and Rough (1985) minus the egg sets transferred to the WFVZ.</p>						

SUPPLEMENTAL MATERIAL TABLE S2

Supplemental Material Table S2. Number of visits to egg and skin collections at selected museums housing major egg collections in Europe and USA (>10,000 egg sets), and in Latin America (>1,000 egg sets).

Museum acronym/ Country ¹	Eggs		Skins		Source of number of visits
	Number of sets/eggs ¹	Number of visits	Number of skins	Number of visits	
NHMUK/UK	450,000	77 visitor days (2006-2007) 20 visitors (1 April 2017 to 31 March 2018)	750,000 ²	7 times more than egg collection (2006-2007) 132 visitors (1 April 2017 to 31 March 2018)	Russell et al. (2010) D. Russell
WFVZ/USA	275,000	10 visitors/year	56,000	30 visitors/year	L. S. Hall
MfN/Germany	50,000	1-2 visitors + requests/year	160,000	60-80 visits/year	S. Frahnert
NMNH-Smithsonian/USA	47,500	2 visits/year	450,000 ²	100 visits/year ³	C. Milensky, pers. comm.
NMS/UK	45,000	9.8 visitor days/year (1980-2019)	66,000	10-20 visitor days/year (2015-2018)	B. McGowan
RMNH/The Netherlands	39,459	1 visit and 6 digital requests in 3 years (2014, 2016, 2017)	170,000 ²	-	P. Kamminga
ZNS/Germany	21,000	2-3 visits/year	9,000 ²	2-3 visits/year	F. D. Steinheimer
MHNG/Switzerland	18,562	3 visits in last 15 years	24,348	10 visits in last 15 years	A. Cibois and L. Vallotton
AMNH/USA	16,679	2 visits/year	-	-	P. Sweet
NMW/Austria	13,000	5-10 visits/year (2011-2017)	100,000	15-50 visits/year (2011-2017)	A. Gamauf
Florida MNH/USA	10,400	2.4 loans + requests + visits/year (2013-2017)	20,500 ²	11.6 loans + requests + visits/year (2013-2017)	T. Webber, pers. comm.
NMBE/ Switzerland	8,955	2 visits (2008-2017)	8,170	20 visits (2008-2017)	M. Schweizer
IAvH/Colombia	4,600	4 visits in last 5 years	12,500	9 visits/year (2015-2017)	D. E. Reina, pers. comm. and S. Cordoba-Cordoba
MZUSP/Brazil	2,200	3 visits in last 10 years	114,000	>40 visits/year (last 10 years) ³	L. F. Silveira
MACN/Argentina	1,000 egg sets + 1,000 eggs	3 visits/year (2015-2017)	75,000 ²	18 visits/year (2015-2017)	D. A. Lijtmaer

SUPPLEMENTAL MATERIAL

¹ See Supplemental Material Table S1 for names of museums and sources of number of egg sets/eggs in collections.

² Source of number of skins (Kiff and Hough 1985, Mearns and Mearns 1998, Roselaar 2003, Escalante 2005).

³ Skins/skeletons/fluids collections.

SUPPLEMENTAL MATERIAL TABLE S3

Supplemental Material Table S3. Topics of studies using bird eggs from museum collections, with a sample of references for each topic.

Subject	Source
Variation in breeding traits and patterns with time and space	Fisher 1937, Johnston 1954, Anderson and Hickey 1970, Murray 1976, Austin 1977, Svensson 1978, Koenig 1984a, 1984b, Beissinger 1986, Moore and Koenig 1986, Rodgers 1990, Olsen and Maples 1993, Green 1998, McNair 2000, Scharlemann 2001, Tryjanowski 2002, Møller et al. 2011, Carter and Sealy 2011, Blight 2011, 2012, Heming and Marini 2015, Hammer 2017, Duursma et al. 2019, Delhey 2020
Evolution of egg colors and patterns	Moksnes and Røskaft 1995, Øien et al. 1995, Kiff 1996, Cherry and Bennett 2001, Stokke et al. 2002, Avilés and Møller 2003, 2004, Soler et al. 2003, 2005, Avilés et al. 2006, Starling et al. 2006, Hanley et al. 2010, 2013, Stoddard and Stevens 2010, 2011, Igic et al. 2012, Abernathy and Peer 2014, Stoddard et al. 2014, Caves et al. 2015, Thomas et al. 2015, Lahti and Ardia 2016, Wiemann et al. 2017, 2018, Wisocki et al. 2019
Brood parasite and host egg evolution	Friedmann and Kiff 1985, Spaw and Rowher 1987, Lahti 2005, Spottiswoode 2010, Jaeckle et al. 2012
Breeding biology	Harrison and Holyoak 1970, Balát and González 1982, Stevenson et al. 1983, Koenig 1984a, Miró 1984, McGowan and Massa 1990, Lowen 1999, McNair 2000, McGhie and Logunov 2005, Mallet-Rodrigues et al. 2006, Carter and Sealy 2010, Maurer et al. 2010, Ingels and Greeney 2011, Knox and Piertney 2012, Hauber 2014, Heming et al. 2016, Ingels et al. 2017, Luna et al. 2017, Marini and Heming 2017, Lopes et al. 2018, Monsalvo et al. 2018, 2020
Egg morphology	Schönwetter and Meise 1960-1992, Tyler 1969, Väisänen 1969, Hoyt 1976, McKinley 1977, Tyler and Fowler 1979, Mikhailov 1997, Green 1998, Tryjanowski et al. 2001, Mallory et al. 2004, Gill 2007, Cassey et al 2010, Maurer et al. 2012, 2015, Denis and Olavarrieta 2011, Denis et al. 2013, , Stoddard et al. 2017, Duursma et al. 2018, Birkhead et al. 2019, Marcuk et al. 2019, Stoddard et al. 2019

DDT and other chemical contamination, and environmental biomonitoring	Ratcliffe 1967, Hickey and Anderson 1968, Peakall 1974, Morrison and Kiff 1979, Newton et al. 1979, Olsen and Olsen 1979, Peakall and Kiff 1979, Olsen and Peakall 1983, Olsen et al. 1993, Flores and Martins 1997, Schwarzbach et al. 2001, Scharlemann 2003, Jagannath et al. 2007, Hanley and Doucet 2012, Klein et al. 2012, Sharpe et al. 2020
History of ornithology and ornithologists	Dabenne 1926, Walters 1994, 2005, Fisher and Warr 2003, Steinheimer 2004, Duarte 2006, Lowe et al. 2010, Segura et al. 2014 a, b, Frahnert and Buden 2008, Frahnert et al. 2015, McGhie 2017, Marini et al. 2018, Gill et al. 2019
Extinct bird species, and conservation of uncommon bird species	McKinley 1977, Carter et al. 2005, Clarke et al. 2006, Chilton and Sorenson 2007, Gill 2007, Walters et al. 2007, Igic et al. 2009, Huynen et al. 2010, Maurer et al. 2010, Oskam et al. 2010, Grellet-Tinner et al. 2012, Grealy et al. 2017
Genetic analyses	Graves and Braun 1992, Cooper 1994, Chilton and Sorenson 2007, Lee and Prÿs-Jones 2008, Egloff et al. 2009, Huynen et al. 2010, Kruckenhauser and Haring 2010, Presslee et al. 2018, Grealy et al. 2019
Systematics	Ihering 1904, Wetmore 1962, Tyler 1969, Olsen and Marples 1993, <u>Zelenitsky</u> and Modesto 2003, Apolinaire and Turnes 2010, Cassey et al 2010, Grellet-Tinner et al. 2012, Tomotani and Silveira 2016
Reconstruction of historical and paleo environments and biomolecular archaeology	Keepax 1981, Johnson et al. 1993, 1998, Clarke et al. 2006, Medina et al. 2011, Stewart et al. 2014, Serangeli and Steinheimer 2016, Wiemann et al. 2017, 2018, Presslee et al. 2018
Historical demography	Beissinger 1986, Beissinger and Peery 2007, Blight 2012
Diet	Schaffner and Swart 1991, Hobson 1995, Clarke et al. 2006

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