NOTES

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OVERGROWN BILL IN A NORTHERN MOCKINGBIRD (*MIMUS POLYGLOTTOS*) FROM WEST TEXAS, WITH A REVIEW OF BILL DEFORMITIES IN THE GENUS *MIMUS*

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ABSTRACT—We documented a Northern Mockingbird (*Mimus polyglottos*) with a bill deformity consistent with Avian Keratin Disorder (AKD) from West Texas. However, bill deformities remain underreported in the literature and, as such, we also reviewed photographs deposited in participatory science databases for the genus *Mimus* to estimate rates of bill deformities for the group. We found individuals with deformed bills in Chilean (*M. thenca*), Galapagos (*M. parvulus*), Bahama (*M. saturninus*), Patagonian (*M. patagonicus*), Northern (*M. polyglottos*), White-banded (*M. triurus*), and Tropical (*M. gilvus*) mockingbirds. Within the genus *Mimus,* we found that Chilean Mockingbird had the highest proportion of individuals that showed evidence of a bill deformity (2.16%).

RESUMEN—Reportamos un cenzontle norteño (*Mimus polyglottos*) con una deformación del pico consistente con el desorden de queratina aviar (AKD) en el oeste de Texas. Sin embargo, las deformidades del pico siguen siendo poco reportadas en la literatura y, por eso, también revisamos las fotografías depositadas en las bases de datos de ciencia participativa para el género *Mimus* para estimar las tasas de deformidades del pico para el grupo. Encontramos individuos con picos deformados en los cenzontles chileno (*M. thenca*), de los Galápagos (*M. parvulus*), de las Bahamas (*M. saturninus*), patagónico (*M. patagonicus*), norteño (*M. polyglottos*), de bandas blancas (*M. triurus*) y tropical (*M. gilvus*). Dentro del género *Mimus*, encontramos que el cenzontle chileno tenía la mayor proporción de individuos que mostraban evidencias de una deformación del pico (2.16%).

Bill deformities in wild birds have many potential causes, including injury to the growth plate, nutritional deficiencies, chemical exposure, and parasites or disease (Craves, 1994). Such malformations afflict a variety of species, including both passerines and nonpasserines, and have been documented worldwide (Craves, 1994; Casaux, 2004; Jones et al., 2015; Souza et al., 2016; Valdebenito et al., 2018). Bill deformities are rarely observed in nature, with an occurrence estimate of <1% in wild birds (Pomeroy, 1962). Monitoring for evidence of abnormal bills is of interest because a high rate of bill deformities in a population (and elongated bills in particular) can indicate the presence of emerging zoonotic diseases such as avian keratin disorder (AKD), which has been linked to the novel poecivirus as a potential cause (Handel et al., 2010; Van Hemert and Handel, 2010; Van Hemert et al., 2012; Zylberberg et al., 2018). Individuals with AKD typically have an overgrowth of the keratin layer of the beak (rhamphotheca), resulting in abnormally long and often crossed bills, which may affect individual foraging ability and health (Van Hemert and Handel, 2010; Van Hemert et al., 2012; Gorosito et al., 2016). Some individuals with AKD have additional deformities of other keratinized appendages such as feathers, feet, and claws (Handel et al., 2010).

The primary axis of bill variation in the family Mimidae (thrashers, mockingbirds, tremblers, and catbirds) is in the length and degree of curvature of the bill (Billerman et al., 2022), and some taxa within Mimidae are known to have an unusually high incidence of bill deformities, such as thrashers of the genus *Toxostoma* (Brown, 1976; Craves,

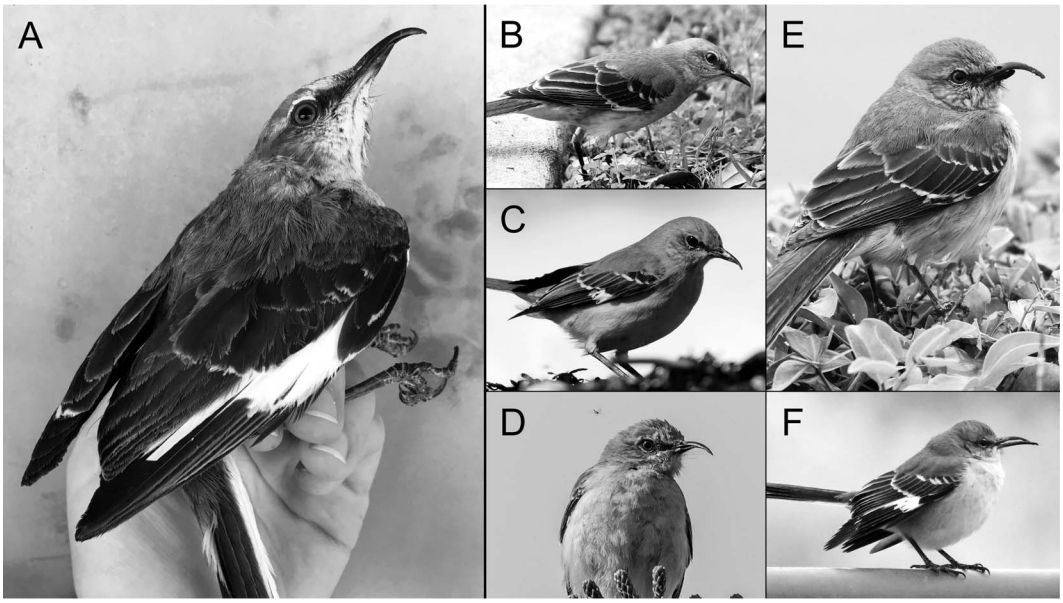

Fig. 1—A) Northern Mockingbird (*Mimus polyglottos*) with a bill deformity captured at Black Gap Wildlife Management Area, Brewster County, Texas, on 15 May 2017. Photo by O.J. B–F) The range of bill deformities present in Northern Mockingbirds from normal (B; ML140486411), to subtle (C; ML51491951), moderate (D; ML82563921), and pronounced (E–F; ML130599901, ML295217841), based on photographs in participatory science databases.

1994; Wolfe et al., 2012; Kasper, 2019). Despite the relative frequency with which photographs of mockingbirds with deformities appear online (Appendix 1), we found little published information on bill deformities in Northern Mockingbirds, specifically. Thus, we contextualize our note with a review of published records of bill deformities in the genus *Mimus*, and we summarize other observations of mockingbirds with elongated or crossed bill deformities from participatory science databases (also known as community or citizen science; Ellwood et al., 2023; Appendix 1). The potential evolutionary significance of the apparent high rate of bill deformities in Mimidae (Craves, 1994; this study) presents an intriguing avenue of future research.

Observation of a Northern Mockingbird with an Overgrown Bill—On 15 May 2017, during avian surveys at Black Gap Wildlife Management Area (WMA) near Alpine in Brewster County, Texas, we captured an adult male Northern Mockingbird (*Mimus polyglottos*) in a mist net presenting features consistent with AKD, in mesquite (*Prosopis*)-dominated desert scrub. Northern Mockingbirds undergo some short distance seasonal movements (and at the northern limits may be partially migratory; David et al., 1990); however, based on the date and reproductive data (the focal individual had no molt or fat, the skull was 100% ossified, and the left testis was 10 × 6 mm) we concluded that the populations at Black Gap WMA were local breeders. The deformed individual had an overgrown and slightly decurved maxilla (Fig. 1A) with notable wear to the bill keratin and organic material stuck to the tip. The bird also presented with foot deformities (on the right foot middle toe bent, missing third toe, and on the left foot missing first and second toes). We noted an infestation of mites and lice on the head, body, and flight feathers, which corroborates previous evidence that birds with deformed or missing feet have high parasite loads because of difficulty preening with damaged appendages (Bush and Clayton, 2018).

We used morphometric measurements to assess the degree of deformation in the Black Gap WMA mockingbird in relation to 23 individuals with apparently normal bills, including 6 other Northern Mockingbirds collected at Black Gap WMA and 17 specimens from the Trans-Pecos region housed at the Louisiana State University (LSU) Museum of Natural Science and the University of Texas El Paso Biodiversity Collections (UTEP). A.E.H. and O.J. measured all specimens with digital calipers by following standard protocols (Baldwin et al., 1931). Relative to the undeformed specimens, the focal individual had an abnormally elongate bill (bill length from nares 16.24 mm vs. mean 12.19 ± 0.34 mm 95% confidence interval [*CI*]; Fig. 2) but did not differ significantly in the other mensural characters we measured (Fig. 2). Intriguingly, the deformed Northern Mockingbird superficially resembled some thrasher species (Mimidae; *Toxostoma*) that naturally have elongated and decurved bills. Two other individuals at the same locality presented with abnormal feet (LSUMZ 197454 was missing the right foot and had lesions on two of the left toes; LSUMZ 197455 was missing the middle right toe); however, none of these specimens had elongated toes. These individuals also had normal bills, leading us to suspect that the toe deformities we observed were the result of causes other than AKD. Interestingly, the bird with the deformed bill fell just under the average mass of the other Northern Mockingbirds from the same region (mass 41.9 g vs. mean 45.4 g ± 2.4 g 95% *CI*) and did not present with 'thin' pectoral muscle as expected in an emaciated

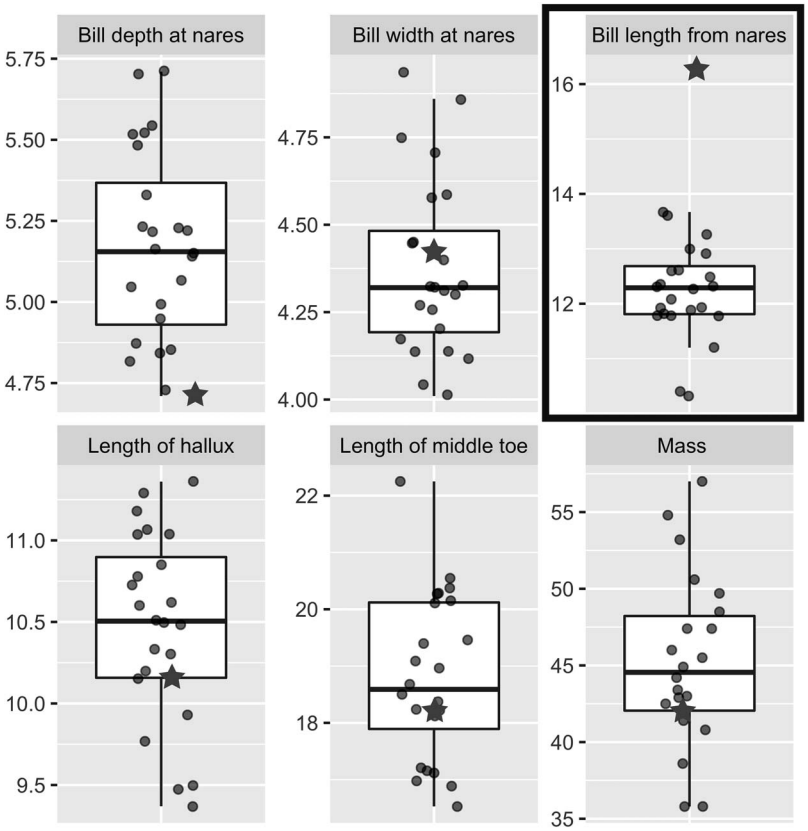

Fig. 2—Measurements of Northern Mockingbirds from the Trans-Pecos region of West Texas. Values for the deformed individual are highlighted with a star, which differ from the other Northern Mockingbirds only in "Bill length from nares" (black outline). All measurements are in millimeters except mass, which is in grams. The box plots show the interquartile range (IQR) with the horizontal line corresponding to the median, and the vertical lines representing $\pm 1.5 \times$ IQR. Specimens measured: LSUMZ—197454–197459, 181929, 182555, 2097, 182011, 177480, 173705, 177479, HH 1864. UTEP—1585, 1782, 2024, 2226, 2425, 2614, 2654, 2809, 2850, 2885. For raw measurements see Appendix 2.

bird, a phenomenon that has been documented in some birds with bill deformities (Gorosito et al., 2016). This suggests that in this case, despite the deformed bill and feet and the high parasite load, the bird was relatively healthy and able to forage, perhaps using its bill to probe the ground as has been suggested for other individuals with moderately elongated bills with worn tips similar to what we observed (Wolfe et al., 2012). We uploaded photographs of the mockingbird to iNaturalist (iNat; https://www.inaturalist.org/observations/6368927), the Macaulay Library (ML; https://macaulaylibrary.org/asset/60652801), and the United States Geological Survey Beak Deformity Database (https://alaska.usgs.gov/science/biology/landbirds/beak_doefrmity/observerreport.php). We did not isolate poecivirus for the deformed individual, so we cannot confirm nor rule out AKD. However, a voucher specimen and associated tissue samples for the individual described above are deposited in the ornithology and genetic resource collections at the LSU Museum of Natural Science (specimen: LSUMZ 197457, tissues: B-93995), thus facilitating testing in the future.

Rates of Bill Deformities in the Genus Mimus—The genus *Mimus* (Passeriformes: Mimidae) contains 14 species whose distributions span both temperate and tropical latitudes in the Western Hemisphere. *Mimus* includes five species endemic to oceanic islands, four of which are taxa of conservation concern (Billerman et al., 2022) that could be particularly vulnerable to zoonotic disease outbreaks such as AKD (e.g., small population sizes mean they could be vulnerable to extinction events). Mockingbirds are also highly vocal and easily observed, making them an ideal group for tracking physically abnormal birds. We excluded records of shortened or fractured bills, which are likely the result of injury, and we removed duplicate images of the same individual (though we did not try to account for duplicates across platforms). To estimate rates of elongate bill deformities, we reviewed ML images in January and February of 2021. For species with relatively few images, all photographs were inspected. We reviewed photographs for Northern Mockingbird from the earliest records (1968) through 2017, the year of our observation. Rates were then calculated by species based on the total number of ML photographs for the time period reviewed (Table 1). For the purposes of this analysis we restricted deformities to obvious malformations and excluded individuals with slight "hooks" at the end of the bill that appeared otherwise normal, because these could

TABLE 1—Estimates of rates of bill deformities involving elongated or crossed bills in the genus *Mimus* from a review of photos in the Macaulay Library (ML) at the Cornell Lab of Ornithology. For a full list of records see Appendix 1. Start date was 1 January, and end date was 31 December for each year.

Common name	Latin name	Start year	End year	No. of photos in ML[a]	No. deformed	Date reviewed[b]	Est. rate (%)[c]
Chilean Mockingbird	*Mimus thenca*	2005	2021	1,624	35	29 Jan 21	2.16
Galapagos Mockingbird	*M. parvulus*	1976	2020	1,052	9	21 Jan 21	0.86
Bahama Mockingbird	*M. gundlachii*	1993	2021	1,638	4	22 Jan 21	0.24
Chalk-browed Mockingbird	*M. saturninus*	1992	2021	5,328	8	10 Feb 21	0.15
Patagonian Mockingbird	*M. patagonicus*	1997	2021	1,057	1	2 Feb 21	0.09
Northern Mockingbird	*M. polyglottos*	1968	2017	20,172	16	6 Jan 21	0.08
White-banded Mockingbird	*M. triurus*	1995	2021	1,658	1	3 Feb 21	0.06
Tropical Mockingbird	*M. gilvus*	1974	2021	7,054	2	6 Jan 21	0.03
Brown-backed Mockingbird	*M. dorsalis*	2003	2020	176	0	6 Jan 21	0.00
Floreana Mockingbird	*M. trifasciatus*	2005	2020	84	0	6 Jan 21	0.00
Hood Mockingbird	*M. macdonaldi*	1976	2020	485	0	6 Jan 21	0.00
San Cristobal Mockingbird	*M. melanotis*	2003	2020	345	0	11 Jan 21	0.00
Long-tailed Mockingbird	*M. longicaudatus*	2004	2021	975	0	11 Jan 21	0.00
Socorro Mockingbird	*M. graysoni*	2006	2018	13	0	6 Jan 21	0.00

[a] No. of photos in ML refers to the total number of photos present for a given species on the date reviewed in the ML.
[b] We include the "date reviewed" column to note when the records were accessed, to help with repeatability.
[c] Est. rate = no. deformed/no. of photos in ML.

have resulted from variation in wear to the mandible. Note that deformity rates in photographs may be biased toward individuals with deformities (slightly inflating percentages) because photographers are more incentivized to document "rare" phenomena like abnormal-looking birds. We also evaluated photographs in iNat via the "bills with deformed beaks" project (https://www.inaturalist.org/projects/birds-with-deformed-beaks) on 11 May 2022 and images from Flickr, another popular bird photo archive with "comment" capabilities, on 14 July 2022 with the search terms "mockingbird bill deformity," "mockingbird abnormal bill," and "mockingbird deformed bill." We used these records to fill in our distributional data (Fig. 3), and to verify that there were no species for which we lacked bill deformity records in the ML that had records in other databases. We did not include these auxiliary data in our bill deformity rate calculations.

We documented cases of elongated or crossed bill deformities in both widespread species such as Patagonian (*Mimus patagonicus*; Gorosito et al., 2016; Bianchini and Arenas, 2018), Chalk-browed (*M. saturninus*; Souza et al., 2016; Bianchini and Arenas, 2018), Tropical (*M. gilvus*), White-banded (*M. triurus*), and Northern (*M. polyglottos*) mockingbirds, as well as several of the range-restricted species including Chilean (*M. thenca*; Valdebenito et al., 2018), Galapagos (*M. parvulus*), and Bahama (*M. gundlachii*) mockingbirds (Fig. 3). The magnitude of bill deformity varied greatly from subtle (e.g., iNat 106518983, ML 121946921) to pronounced (e.g., iNat 37682887, iNat 28474550, ML 277441011, ML 138692361, ML 169326991). The proportion of individuals with bill deformities was highest in Chilean Mockingbird (2.16%), and relatively low in Northern Mockingbird (0.08%; Table 1). Overall, we observed high geographic concentrations of bill deformities in temperate regions of both the Northern and Southern hemisphere (Fig. 3), although this distribution may at least partially result from regional variation in numbers of bird photographers.

During the course of the photograph review, we observed that the ability to create projects and annotate participatory science observations in iNaturalist greatly facilitated characterization of bill deformities, given their apparent low rate of occurrence. Popular platforms such as eBird, which is the main source for images deposited in the ML, might consider implementing additional searchable "comment" options or more nuanced tags such as "bill aberrant" or "deformity present" for photographs to facilitate similar studies using participatory science to monitor for disease prevalence (e.g., Dhondt et al., 1998; Christiansen et al., 2020). We encourage all birdwatchers, bird-banders, and ornithologists to photograph any birds that present with bill deformities and upload this documentation to both ML and iNat to help track rates of such malformations and to help identify emerging "hotspots" of bill deformities, similar to previous efforts in Alaska (Handel et al., 2010; Van Hemert and Handel, 2010) and Florida (Brown, 1976; Craves, 1994). Additionally, whenever possible and with appropriate permits, we encourage archiving specimens and tissues for birds with bill deformities in natural history collections, which are uniquely poised to serve as biorepositories that can facilitate the screening of putatively healthy and deformed individuals for zoonotic diseases, testing for pesticide and/or heavy metal exposures, and tracking of emerging infectious diseases through time (Christiansen et al., 2020; Colella et al., 2020; Cook et al., 2020).

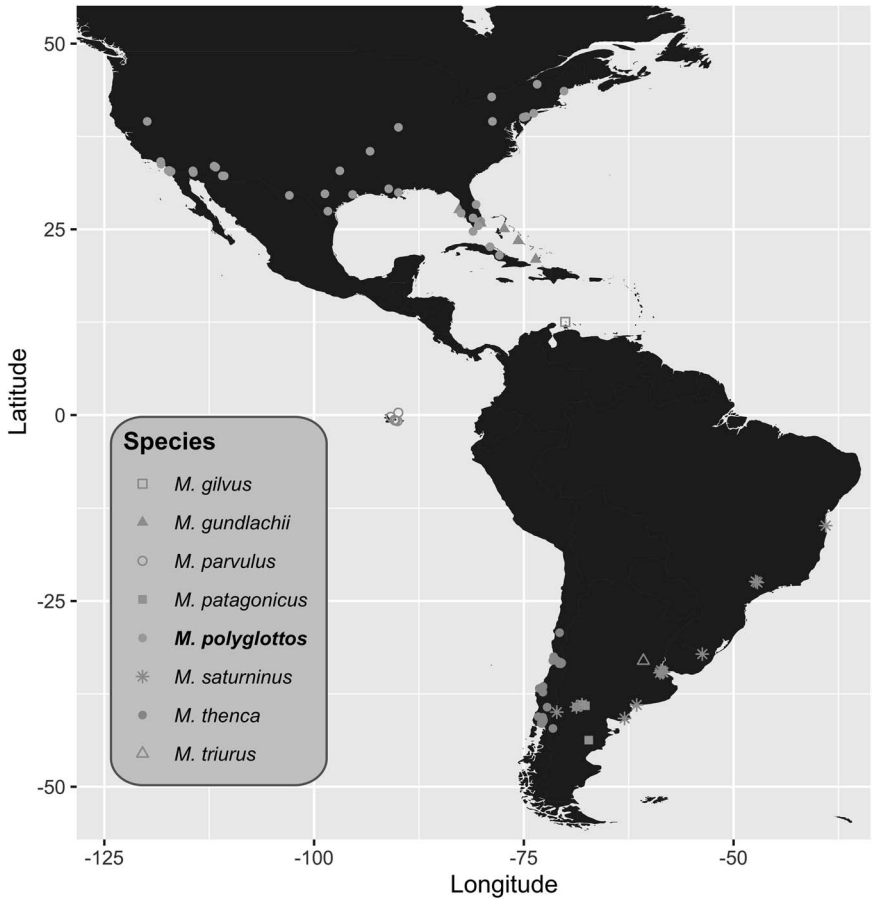

Fig. 3—Map of individuals with bill deformities we documented in the genus *Mimus*. For all data see Appendix 1.

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Appendix 1—Records of bill deformities in the genus *Mimus*. ML = Macaulay Library at the Cornell Lab of Ornithology; iNat = iNaturalist; ACD = after cutoff date (for auxiliary observations); — = data from a published record.

Species	Location	Date	Observer	Source	Link or reference
M. gilvus	Costa Linda Resort, Aruba	13 Dec 2015	Larry Sirvio	ML	ML22133011
M. gilvus	Eagle, Aruba	2 Jun 2019	Glenda Tromp	ML	ML162327681
M. gundlachii	Fort de Soto, FL, USA	14 May 2010	Dan Irizarry	Flickr	/danirizarry/4607959884
M. gundlachii	Miami-Dade, FL, USA	19 May 2014	David Kirschke	ML	ML240465871, ML132977301
M. gundlachii	Inagua, Bahamas	10 Mar 2017	Erkia Gates	ML	ML50736511
M. gundlachii	New Providence, Bahamas	15 Jan 2020	Roy Kasius	ML	ML200018781
M. gundlachii	Exuma Cays, Bahamas	1 Feb 2020	Kamella Boullé	ML	ML206871661
M. parvulus	Isla Santa Fé, Galápagos, Ecuador	8 Aug 1992	Josep del Hoyo	ML	ML205152011
M. parvulus	Isla Genovesa, Galápagos, Ecuador	6 Jun 2015	Bob Hasenick	ML	ML222375421
M. parvulus	Isla Santa Cruz, Galápagos, Ecuador	6 Oct 2018	Noam Markus	ML	ML277441011
M. parvulus	Isla Santa Cruz, Galápagos, Ecuador	9 Oct 2018	Alena Capek	ML	ML247893101
M. parvulus	Isla Santiago, Galápagos, Ecuador	10 Oct 2018	Noam Markus	ML	ML277802391
M. parvulus	Isla Santa Cruz, Galápagos, Ecuador	12 Feb 2019	J Braun	ML	ML247362951
M. parvulus	Isla Santa Cruz, Galápagos, Ecuador	3 Jul 2019	Frank Fabbro	ML	ML167850401
M. parvulus	Santa Cruz, Galapagos, Ecuador	28 Jul 2019	sea-kangaroo	iNat	/33051999
M. parvulus	Isla Santa Cruz, Galápagos, Ecuador	7 Aug 2019	Jay McGowan	ML	ML188302931
M. parvulus	Isla Santa Cruz, Galápagos, Ecuador	7 Aug 2019	Jay McGowan	ML	ML188637141
M. patagonicus	Neuquén, Argentina	19 Sep 2010	Fernanda Ponzoni	—	Bianchini and Arenas, 2018
M. patagonicus	Chubut, Argentina	1 Dec 2015	Héctor Gonda	—	Gorosito et al., 2016
M. patagonicus	Neuquén, Argentina	22 Apr 2017	Cynthia Arenas	—	Bianchini and Arenas, 2018
M. patagonicus	Rio Negro, Argentina	22 Dec 2020	Juan Tapia	ML	ML290246101
M. polyglottos	Pembroke Pines, FL, USA	5 Apr 2009	Kenneth Schneider	Flickr	/rosyfinch/3416101973/
M. polyglottos	No info	20 Jun 2009	Green Hocker	Flickr	/mattandjess/4119886503/
M. polyglottos	Queens, NY, USA	15 Jan 2010	Lisa Scheppke	ML	ML80615761
M. polyglottos	Hollywood, FL, USA	22 Nov 2011	Kenneth Schneider	Flickr	/rosyfinch/6383872681/
M. polyglottos	Osprey, FL, USA	29 Dec 2011	Alex Burdo	Flickr	/birdshots-birdlister/6630470993/
M. polyglottos	Tucson, AZ, USA	19 Apr 2012	Michael Skinner	Flickr	/12921146@N04/6947676744/
M. polyglottos	Gilbert, AZ, USA	31 Jan 2013	John Mihalka	ML	ML149370511
M. polyglottos	Homestead, FL, USA	31 Jan 2013	Michael O'Brien	ML	ML130599901
M. polyglottos	W Miramar Water Conserv. Area, FL, USA	20 Jan 2014, 4 Oct 2013	Kenneth Schneider	Flickr	/rosyfinch/12054918275/, /rosyfinch/10089361003/
M. polyglottos	Travis, TX, USA	11 Jan 2014	cullen	iNat	/499953
M. polyglottos	W Miramar Water Conserv. Area, FL, USA	27 Mar 2014	Kenneth Schneider	Flickr	/rosyfinch/13451138035/
M. polyglottos	Imperial Dam Rd, Yuma County, AZ, USA	28 Nov 2014	finatic	iNat	/1105907
M. polyglottos	W Miramar Water Conserv. Area, FL, USA	3 Jan 2015, 15 Dec 2014	Kenneth Schneider	Flickr	/rosyfinch/15999666168/, /rosyfinch/16029485135/
M. polyglottos	Boerne City Park, Boerne, TX, USA	9 Oct 2015	romeyswanson	iNat	/2090682
M. polyglottos	South FL, USA	3 Jan 2016	Joel Rosenthal	Flickr	/joelnrosenthal/24141773711/, /joelnrosenthal/23594135994/
M. polyglottos	Villa Clara, Cuba	5 Feb 2016	Pat McKay	ML	ML24434971

Appendix 1—Continued.

Species	Location	Date	Observer	Source	Link or reference
M. polyglottos	Phoenix, AZ, USA	1 Apr 2016	Candace Porth	Flickr	/maccandace/26388275091/
M. polyglottos	Erie, NY, USA	12 Apr 2016	Becky Harbison	ML	ML26978701
M. polyglottos	San Diego, CA, USA	14 May 2016	Peter Nguyen	ML	ML28748051
M. polyglottos	Essex, NY, USA	2 Jul 2016	Gary Chapin	ML	ML30808221
M. polyglottos	Cuba	15 Oct 2016	Laura Erickson	Flickr	/lauraerickson/30616466715/
M. polyglottos	Madison, IL, USA	22 Oct 2016	Roy Stewart	ML	ML37953681
M. polyglottos	Mercer, NJ, USA	4 Dec 2016	Mark Gallagher	ML	ML41745261, ML41718591
M. polyglottos	Monroe, FL, USA	15 Dec 2016	Curtis Mahon	ML	ML42614921
M. polyglottos	Mineral, WV, USA	29 Nov–20 Dec 2016	Adele Wilson	ML	ML43718251, ML42367281, ML42263841, ML42263291, ML41359911
M. polyglottos	Pima, AZ, USA	20 Dec 2016	Tina Toth	ML	ML43062351
M. polyglottos	Yuma County, AZ, USA	24 Feb 2017	John F. Gatchet	ML	ML52869591, ML52869531, ML52869501, ML52869481, ML52869461, ML52869451, ML52869261
M. polyglottos	Cumberland County, ME, USA	17 Mar 2017	Gary Jarvis	ML	ML51491951
M. polyglottos	Alpine, TX, USA	15 May 2017	—	—	This publication
M. polyglottos	Hagarville, Arkansas, USA	8 Aug 2017	mayfly1963	iNat	/7466064
M. polyglottos	St. Bernard Parish, LA, USA	24 Sep 2017	Glenn Ousset	ML	ML69870941
M. polyglottos	Brevard County, FL, USA	19 Oct 2017	Vittorio Cattelan	ML	ML72403301
M. polyglottos	Broward, FL, USA	19–20 Jan 2018	David Hall, Steven Kaplan	x- ML ACD	ML82563921, ML82563911, ML82563901, ML83150201
M. polyglottos	San Diego, CA, USA	30 Jan 2018	Charlotte Morris	x- ML ACD	ML84027981, ML84027551
M. polyglottos	Wilmington, Los Angeles, CA, USA	6 Jun 2018	oc_birder	Flickr	/56018183@N08/42930345042/
M. polyglottos	San Carlos, San Diego, CA, USA	7 Jul 2019	milliebasden	iNat	/28474550
M. polyglottos	Los Angeles, CA, USA	6 Sep 2019	gregslak	iNat	/32248240
M. polyglottos	W Miramar Water Conserv. Area, FL, USA	24 Oct 2019	Kenneth Schneider	Flickr	/rosyfinch/48952970273/
M. polyglottos	Pressler St, Houston, TX, USA	10 Mar 2020	embosu	iNat	/39817886
M. polyglottos	W Miramar Water Conserv. Area, FL, USA	15 Aug 2020	Kenneth Schneider	Flickr	/rosyfinch/50229024378/
M. polyglottos	San Diego County, CA, USA	16 Nov 2020	kpogliano	iNat	/65051935
M. polyglottos	Phoenix, AZ, USA	21 Nov 2020	Candace Porth	Flickr	/maccandace/50657274368/
M. polyglottos	Washoe, NV, USA	6 Jan 2021	Jane Thompson	x- ML ACD	ML295217841
M. polyglottos	Baton Rouge, LA, USA	23 Feb 2021	Lewis Lindsly	Louisiana Birds	facebook.com/groups/bird-louisiana/permalink/146716990630780/
M. polyglottos	South TX, USA	30 Dec 2021	John Mangold	Flickr	/johnrmangold/51807400321/
M. polyglottos	PA, USA	5 Feb 2022	mbwildlife	iNat	/106187946
M. polyglottos	PA, USA	10 Feb 2022	mbwildlife	iNat	/106518983
M. saturninus	São Paulo, Brazil	15 Jun 2011	Rogério Sorvillo	—	Souza et al., 2016
M. saturninus	Lagos de Palermo, Buenos Aires, Argentina	18 Jun 2011	nicoolejnik	iNat	/1861678
M. saturninus	Puerto Madero, CABA, Argentina	17 Jan 2014	carancho	iNat	/37684229
M. saturninus	Bahia, Brazil	21 Aug 2014	Rudi Laps	ML	ML303380091, ML303380081, ML303380061
M. saturninus	Río Negro, Argentina	8 Mar 2016	Federico de Maio	—	Bianchini and Arenas, 2018
M. saturninus	Buenos Aires, Argentina	15 Apr 2016	Diego Perez	ML	ML27277321
M. saturninus	Cerro Largo, Uruguay	11 Sep 2016	Christopher Prevett	ML	ML35002971, ML35002961
M. saturninus	Río Negro, Argentina	4 Mar 2017	Federico de Maio	—	Bianchini and Arenas, 2018

Appendix 1—Continued.

Species	Location	Date	Observer	Source	Link or reference
M. saturninus	Neuquén, Argentina	2 Dec 2017	Fernanda Gauna	—	Bianchini and Arenas, 2018
M. saturninus	Neuquén, Argentina	2 Dec 2017	Fernanda Gauna	—	Bianchini and Arenas, 2018
M. saturninus	Buenos Aires, Argentina	3 Nov 2018	Marcelo Szczepanik	ML	ML121946921
M. saturninus	Buenos Aires, Argentina	14 Sep 2019	Pedro Rivero	ML	ML177087891
M. saturninus	Junín de los Andes, Argentina	15 Nov 2019	pogogregorio	iNat	/37688989
M. saturninus	Caballito, CABA, Argentina	17 Jan 2020	ezequielvera	iNat	/37682887
M. saturninus	Ciudad Autónoma de Buenos Aires, Argentina	17 Jan 2020	Ezequiel Vera	ML	ML199869201, ML199869191, ML199869181, ML199869161, ML199869141, ML199869121, ML199869111
M. saturninus	Beccar, Provincia de Buenos Aires, Argentina	5 Jul 2020	alberto_br	iNat	/52503316
M. saturninus	Neuquén, Argentina	14 Jul 2020	Maria Fernanda Gauna	ML	ML249444061
M. saturninus	São Paulo, Brazil	13 Nov 2020	Marcelo Braga	ML	ML279863771
M. thenca	Papudo, Chile	1 Dec 2013	Not specified	—	Valdebenito et al., 2018
M. thenca	Colina, Chile	1 Sep 2014	Not specified	—	Valdebenito et al., 2018
M. thenca	Chubut, Argentina	20 Nov 2014	Nahuel Melisa Aguirre Gago	ML	ML120631041
M. thenca	Talcahuano, Chile	1 Oct 2015	Not specified	—	Valdebenito et al., 2018
M. thenca	Los Lagos, Chile	10 Jan 2016	Pablo Cárcamo Bravo	ML	ML23081771
M. thenca	Guarilihue, Chile	1 Mar 2016	Not specified	—	Valdebenito et al., 2018
M. thenca	Santiago, Chile	1 Aug 2016	Not specified	—	Valdebenito et al., 2018
M. thenca	Santiago, Chile	3 Dec 2016	Matías Garrido	ML	ML42142261
M. thenca	Los Lagos, Chile	20 Feb 2017	Margarita Parraguez	ML	ML49308521
M. thenca	Valparaíso, Chile	15 Oct 2017	Jennifer Clarke	ML	ML172901121
M. thenca	Santiago, Chile	2 Dec 2017	Maria Antonieta Gonzalez Soto	ML	ML77426511
M. thenca	Araucanía, Chile	13 Dec 2017	Sue Plankis	ML	ML78817621
M. thenca	Los Lagos, Chile	6 Feb 2018	Felipe Undurraga	ML	ML93738901
M. thenca	Araucanía, Chile	3 Mar 2018	Pio Marshall	ML	ML168502201
M. thenca	Los Lagos, Chile	23 Mar 2018	Kathleen Keef	ML	ML92436371
M. thenca	Santiago, Chile	30 Apr–18 May 2018	Patricio Hurtado	ML	ML145981621, ML145981611, ML146032751, ML146034041, ML146065911
M. thenca	Santiago, Chile	6 Oct 2018	Felipe Undurraga	ML	ML168152031
M. thenca	Santiago, Chile	3 Feb 2019	Rodrigo Calderón Castillo	ML	ML138692361, ML138692331
M. thenca	Santiago, Chile	13 Feb 2019	Margaret Viens	ML	ML143425151
M. thenca	Santiago, Chile	1 Mar 2019	José Ignacio Catalán Ruiz	ML	ML269441451
M. thenca	Santiago, Chile	2 Mar 2019	Noreen Baker	ML	ML192721781
M. thenca	Bío-Bío, Chile	4 May 2019	Antonella Parra Garrido	ML	ML281932001
M. thenca	Santiago, Chile	14 Jul 2019	Joaquin Vial	ML	ML168173211, ML168173201
M. thenca	Santiago, Chile	21 Jul 2019	Javier Pérez	ML	ML169326991
M. thenca	Santiago, Chile	12 Aug 2019	Vlad Sladariu	ML	ML172333071
M. thenca	Los Lagos, Chile	26 Aug 2019	Gabriel Cardenas, Nicole Arcaya	ML	ML174305901, ML174305231
M. thenca	Valparaíso, Chile	23 Oct 2019	Milena Maira	ML	ML183848461
M. thenca	Santiago, Chile	23 Nov 2019	Marie O'Neill	ML	ML193078661, ML193078651
M. thenca	Santiago, Chile	1 Dec 2019	Felipe Undurraga	ML	ML191108211, ML191108201
M. thenca	Santiago, Chile	4 Jan 2020	Felipe Undurraga	ML	ML198848431
M. thenca	Santiago, Chile	14 Jan 2020	Gabriela Lagos	ML	ML230257211

Appendix 1—Continued.

Species	Location	Date	Observer	Source	Link or reference
M. thenca	Los Lagos, Chile	26 Jan 2020	Paulina Torres Pérez	ML	ML247798971
M. thenca	Santiago, Chile	2 Feb 2020	Eleuterio Ramirez	ML	ML207950501
M. thenca	Coquimbo, Chile	26 Feb 2020	James Court	ML	ML253681481
M. thenca	Santiago, Chile	6 Mar 2020	Michael Weymann	ML	ML213842571
M. thenca	Bío-Bío, Chile	11 May 2020	Waldemar Valdebenito Figueroa	ML	ML234543341
M. thenca	Santiago, Chile	5 Jul 2020	Felipe Undurraga	ML	ML258377361
M. thenca	Santiago, Chile	28 Aug 2020	Pablo Martinez Morales	ML	ML258591851
M. thenca	Santiago, Chile	4 Oct 2020	José Ignacio Catalán Ruiz	ML	ML268417011
M. thenca	Los Lagos, Chile	2 Nov 2020	Nicole Arcaya	ML	ML276860021
M. triurus	Santa Fe, Argentina	12 Aug 2018	Horacio Luna	ML	ML110652571

Appendix 2—Specimen data of Northern Mockingbirds presented in Fig. 2. The (*) indicates the measurements for the deformed individual. NA = not available.

Collection	Specimen	Bill width at nares (mm)	Bill depth at nares (mm)	Bill length from nares (mm)	Length of middle toe (mm)	Length of hallux (mm)	Sex	Mass (g)	County
LSUMZ	197454	4.26	5.52	11.93	18.5	11.04	Male	43.4	Brewster
LSUMZ	197455	4.01	4.95	12.6	16.53	10.15	Female	42.5	Brewster
LSUMZ	197456	4.12	4.84	12.08	16.98	10.62	Male	43	Brewster
LSUMZ	197458	4.33	5.33	11.78	16.89	10.85	Female	38.6	Brewster
LSUMZ	197459	4.45	5.23	11.78	17.12	11.04	Female	40.8	Brewster
LSUMZ	181929	4.4	5.07	12.32	18.12	10.2	Male	54.8	Brewster
LSUMZ	182555	4.14	4.85	12.27	18.22	10.51	Female	57	Hudspeth
LSUMZ	2097	4.86	5.23	12.31	18.24	11.07	Male	NA	Culberson
LSUMZ	182011	4.31	5.7	13.67	17.16	11.29	Male	48.5	Jeff Davis
LSUMZ	177480	4.75	4.82	11.92	17.21	10.5	Female	44.2	Jeff Davis
LSUMZ	173705	4.94	5.14	13.61	19.4	11.18	Male	53.2	Jeff Davis
LSUMZ	177479	4.59	4.99	13.26	19.09	11.36	Male	47.4	Jeff Davis
LSUMZ	HH 1864	4.17	4.73	11.78	18.96	10.48	Male	46	Brewster
UTEP	2809	4.71	5.48	10.4	20.27	9.93	Female	49.7	Jeff Davis
UTEP	2614	4.27	5.22	12.91	20.37	9.77	Female	35.8	El Paso
UTEP	2850	4.2	5.05	11.2	20.28	9.47	Male	50.6	Jeff Davis
UTEP	2425	4.14	4.87	10.32	18.68	9.37	Female	41.4	El Paso
UTEP	2226	4.45	5.54	12.61	22.25	10.78	NA	47.4	El Paso
UTEP	1782	4.3	5.16	12.49	20.55	10.73	Male	44.9	El Paso
UTEP	2024	4.32	5.52	12.35	18.37	10.6	Male	42.9	El Paso
UTEP	1585	4.58	5.71	13	20.11	9.5	NA	NA	El Paso
UTEP	2654	4.32	5.15	11.88	19.46	10.3	Male	45.5	Jeff Davis
UTEP	2885	4.04	5.22	11.82	20.15	10.33	Male	35.8	El Paso
LSUMZ	197457*	4.42	4.71	16.24	18.19	10.16	Male	41.9	Brewster