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MORTALITY IN BIRDS FROM FLORIDA WILDLIFE REHABILITATION CLINICS

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Abstract.— We summarize what we could learn about the cause of death in preparing 1,928 scientific specimens of birds salvaged from wildlife rehabilitation clinics in Florida from 2015 to 2020. Most specimens came from 14 different clinics in one inland and 11 coastal counties, from Pensacola (Escambia County) to Key West (Monroe County). These specimens represent 285 species in 56 avian families. Although our sample is not an unbiased look at avian mortality in Florida, we note these trends: overall trauma was involved in 81.1% of the cases, malnourishment accounted or 12.75% of cases, and illnesses accounted for 6.2%; the last two categories were not mutually exclusive. Trauma was particularly lethal for species found in terrestrial ecosystems, accounting for >93% of the cases. For offshore species, malnourishment accounted for most (78%) of the cases. Sicknesses were most prevalent in near-shore species. When the cause of trauma was known, most injuries were the result of collisions with buildings or windows (29.7%), collisions with moving vehicles (26.1%), or attacks by cats (25.4%).

Key words: birds, collisions, Florida, malnourishment, mortality, trauma, wildlife rehabilitation.

Bird populations the world over are facing increasing threats as the landscapes they inhabit become more hazardous to their well-being, particularly in cities and suburbs with dense populations of people, feral animals, and associated infrastructure (Erickson et al. 2005; Loss et al. 2013, 2014ab; Rosenberg et al. 2019). One way that people try to mitigate these effects is through wildlife rehabilitation clinics (WRCs), where citizens bring in injured or sick birds they have found to receive care and rehabilitation, with the goal of healing the bird and releasing it back into the wild. Most of these WRCs are in heavily populated areas with abundant hazards such as windows, vehicles, power lines, and pet or feral cats.

Despite their best efforts, the staff at WRCs report that 40–70% of the birds they receive eventually succumb to their injuries or illnesses (Schenk and Souza 2014, Molina-López et al. 2017). For decades, the usual terminus for avian carcasses at WRCs was incineration, as required by law. In the late 1990s, the Ornithology Division of the Florida Museum of Natural History (FLMNH) began to network with WRCs in Florida to tap into this rich source of information on the state's birds. Substantial data accompany each WRC specimen that FLMNH

has retrieved and prepared, thereby supplementing the ever-growing body of observational data on Florida birdlife. By preparing data-rich museum specimens from the birds that die at WRCs, the FLMNH has generated scientific information on the state's birds and added value to the services already provided by the WRCs. Subsequent to reporting data on >550 WRC specimens (Kratter et al. 2002), we summarize what we have learned about avian mortality in Florida by preparing nearly 2,000 specimens salvaged from WRCs from 2015–2020.

Methods

Staff at FLMNH makes several trips per year to pick up specimens that have accumulated in the WCR freezers. Usually within a year, we prepare the specimens as round skins, skeletons, spread wings, or combinations thereof. We also save two tissue samples for cryo-storage, each sample typically consisting of breast muscle, heart, and liver, to be used in molecular research. We retain one tissue sample at FLMNH and deposit the other at the Louisiana State University Museum of Natural Science.

We provide the WRCs with FLMNH data slips that are to accompany each specimen when it is placed in a freezer after death. The data slips have fields for recording the date, locality, collector, and observations by the collector or WRC staff on the cause of injury or illness. The FLMNH data slips often are not filled out completely, and many do not include information about the cause of injury.

We derived data about the cause of mortality from some combination of three sources. First, as already mentioned, the original finder (collector) of the injured or sick bird may note information such as "struck by car," or "flew into window," or "caught by cat," or "could not stand up." Second, while examining the bird, the WRC staff evaluates the presence and extent of injuries or illness, noting more specific conditions such as "fractured left wing" or "fractured right leg." These data are kept in the patient's charts and entered into the WRC's computer database or a ledger. If the bird survives, the charts become increasingly filled with data on weight, health conditions, and prognoses. If the bird dies, WRC staff place the carcass in a plastic bag for freezer storage, and usually place a filled out FLMNH data slip in the bag with the bird.

The third source of mortality information is from FLMNH preparators during their dissections, which includes internal and external examinations that evaluate molt, feather wear, reproductive organs, fat levels, age, skull ossification, and any injuries or macroscopic signs of disease. We realize that it is difficult to assess disease in specimens that have been frozen for months or years, so our detection of disease likely underestimates the true extent of avian diseases in Florida's wild birds. Preparators write these data in specimen catalogs and later transcribe data into the curatorial software Specify (Specify Collections Consortium, Lawrence, KS, USA), the software used at FLMNH for its specimen database. Often, the preparators note internal injuries or pathologies that were not detectable in the whole specimen, especially evidence of head trauma, additional broken bones, emaciation, or infection.

Because threats vary widely depending on habitat characteristics (e.g., windows are not a threat for marine taxa), we classified the species by general ecosystem preference as follows: offshore marine (Procellariiformes, Alcidae, *Fregata, Phaethon, Stercorarius, Sula, Rissa, Phalaropus, Anous, Onychoprion, Sterna paradisaea*); nearshore marine (*Aythya, Bucephala, Somateria, Melanitta, Mergus, Gavia, Podiceps, Phalacrocorax, Morus, Thalasseus, Leucophaeus, Sternula, Rhynchops, Sterna dougallii, S. hirundo, Larus marinus, L. fuscus*), other waterbirds (other Anatidae, *Podilymbus, Anhinga*, Ardeidae, other Charadriiformes, Gruiformes), and terrestrial (all other species).

The specimen-based data in this paper do not represent all of the birds that died at the WRCs during the study period. A number of very common species are underrepresented simply because we do not have the staff time, freezer space, or volume of specimen cabinets to prepare and store them. Our necessary system of triage eliminated many if not most individuals of some species (Appendix 1). For the Sandhill Crane (*Grus canadensis*), Double-crested Cormorant (*Phalacrocorax auratus*), Brown Pelican (*Pelecanus occidentalis*), Black Vulture (*Coragyps atratus*), Turkey Vulture (*Cathartes aura*), and Barred Owl (*Strix varia*), all of which do succumb with some regularity at WRCs, we prepared no specimens at all during the study period. Certain other common species, which tend to be on the small side of medium-sized birds, are relatively easy for beginners to prepare. Because training students in avian anatomy is a major part of our mission at FLMNH, these species may be overrepresented in the sample relative to other common species (Appendix 1). In other words, a larger percentage of individuals of these species were prepared as specimens than of other common species. Two other species were overrepresented by specimens because of research interests, namely Cory's Shearwater (*Calonectris diomedea*; project on wing molt underway by AWK) and Eastern Bluebird (*Sialia sialis*; Steadman and Franklin 2017). Also overrepresented were species that are rare in Florida or in our collections, and thus represent higher-priority specimens.

RESULTS

Geographic and taxonomic coverage.—From January 2015 through March 2020, the Ornithology Division of the FLMNH catalogued and prepared 1,928 specimens from WRCs in Florida. We received five or more birds from 14 different clinics (Table 1), which spanned the geographical extent of Florida, from Pensacola to Key West. We received 928 specimens from South Florida (Lee, Collier, Palm Beach, Broward, Miami-Dade, and Monroe counties), whereas 481 specimens were from Central Florida (Volusia, Brevard, and Pinellas counties), and 519 specimens were from North Florida (Escambia, Santa Rosa, and Alachua counties).

The WRC specimens represent 284 species of 56 avian families (Appendix 1). Within this highly diverse sample, 15 species had 20 or more specimens, and 63 others had from 10 to 19 specimens. Because of our triage system (see Methods), these numbers do not reflect the actual numbers of deceased birds that we receive, which in themselves also do not represent the full range of avian mortality at the WRCs.

Of the 284 species and 1,928 total specimens, 165 were terrestrial species (1,269 total specimens), 22 were nearshore species (129 total specimens), 28 were offshore species (173 total specimens), and 69 were other waterbird species (357 total specimens; Fig. 1).

Reason for admittance.—For 1,923 of the specimens, reasons for admittance to WRCs were categorized as injuries (e.g., entrapment in human dwellings, swimming pools, fishing gear), presumed illness or pathologies, or malnourishment; for the other five specimens, one was confiscated from illegal captivity, and four were chicks out of the nest. Injured specimens made up the majority

Table 1. Sources of bird specimens salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020.

Clinic	Location	Number of specimens
North Florida		
Wildlife Sanctuary of Northwest Florida	Pensacola (Escambia, Santa Rosa counties)	484
Florida Wildlife Care	Gainesville (Alachua County)	18
University of Florida School of Veterinary Medicine	Gainesville (Alachua County)	17
Central Florida		
Marine Science Center	Ponce Inlet (Volusia County)	146
Florida Wildlife Hospital	Melbourne (Brevard County)	258
Suncoast Seabird Sanctuary	Indian Shores (Pinellas County)	76
Others		1
South Florida		
Care and Rehabilitation of Wildlife	Sanibel, Ft. Myers (Lee County)	116
Conservancy of Southwest Florida	Naples (Collier County)	219
Cynthia Rohkamm	Lighthouse Point (Palm Beach, Broward counties)	58
South Florida Wildlife Center	Ft. Lauderdale (Broward County)	286
Pelican Harbor Seabird Station	North Miami Beach (Miami-Dade County)	94
Florida Keys Wild Bird Center	Tavernier (Monroe County)	48
Marathon Wild Bird Center	Marathon (Monroe County)	81
Key West Wild Bird Center	Key West (Monroe County)	20
Others		6
Total		1,928

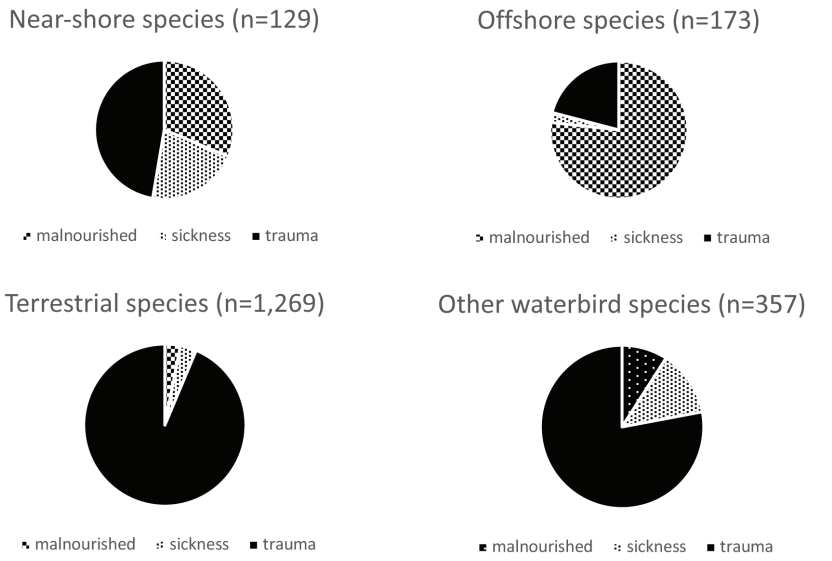

Figure 1. Reason for admittance of birds salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020, based on guild.

(1,560 or 81.1%), malnourished specimens accounted for 244 cases (12.7%), and illness accounted for only 119 cases (6.2%). Evidence of trauma was much higher for terrestrial species (93%) than for bird species associated with water (offshore marine 21%, nearshore marine 47.4%, other waterbirds 78.1%; Fig. 1). Illness was most pronounced in near-shore species (21.4%). Malnourishment was much higher in offshore species (76.7%) and especially rare in terrestrial species (3.1 %)

Agent of injury or illness.—The agent of injury was reported by the original finders for some of the birds and written on the FLMNH data slips by WRC staff, who sometimes added their own observations. Illnesses were reported by veterinarians or veterinary technicians at WRCs. Of the 1,928 specimens, the agent of injury or sickness was determined in 621 (36.0%; Table 2). Four agents each made up >15% of the cases (Table 2): beached seabirds (21.7%), collisions with buildings or windows (20.0%), collisions with moving vehicles (17.6%), and attacks by cats (17.1%). No other agent accounted for more than 5%. Of the 621 mortalities with assigned causes, 67.5% resulted from injuries due to interactions with the human landscape (e.g., windows, buildings, vehicles, pets). For the 418 cases restricted to injuries resulting from interactions with the human landscape, three agents were the cause of most injuries: collisions with buildings or windows (29.7%), collisions with moving vehicles (26.1%), and attacks by cats (25.4%).

Table 2. Agents of injury or illness for bird specimens salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020.

Agent of injury or sickness	n	%
Beached	135	21.7
Hit window or building	124	20.0
Car or other vehicle	109	17.6
Cat	106	17.1
Flew into something	27	4.3
Shot	19	3.1
Fungal or tumor	18	2.9
Red tide	16	2.6
Botulsim	15	2.4
Fishing gear	13	2.1
Dog	11	1.8
Other predator	9	1.4
Hurricane or tropical storm	9	1.4
Electrocuted	5	0.8
Bubblegum	1	0.2
Golf ball	1	0.2
Glue trap	1	0.2
Funnel trap	1	0.2
Motor oil	1	0.2
Total	621	

Types of injuries.—For the 1,536 cases with injury, 863 (56.2%) did not specify the injury. For the 673 cases where the type of injury was specified (Table 3), 767 specific injuries were recorded (some individuals had multiple injuries). Of these, 304 (40.0%) were wing injuries (dislocations or fractures of the shoulder, humerus, ulna, radius, carpometacarpus), 197 (25.7%) were head injuries (head trauma, injuries or fractures of skulls, eyes, or bills), 126 (16.4%) were leg or feet injuries (dislocations or fractures femur, tibiotarsus, tarsometatarsus, toes), and 140 (18.3%) were injuries to the torso (dislocations or fractures of coracoid, furcula, neck, trauma to internal organs, and various paralyses).

Types of illness.—Florida birds regularly undergo mortality events associated with algal blooms (red tides), and other diseases occur with frequency. For 69 cases, the illness was not specified. Of those specified (Table 4), aspergillosis fungal infections (18 cases), botulism (15 cases), and illness resulting from red tide events (16 cases) were listed.

Discussion

For Florida birds, co-occurring with humans is dangerous and often lethal. Wildlife rehabilitation clinics offer some hope for birds

Table 3. Types of injuries recorded for bird specimens salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020.

Type of injury	n	%
Not diagnosed	485	48.7
Head trauma	156	15.7
Wing	108	10.8
Ulna	25	2.5
Humerus	67	6.7
Carpal	15	1.5
Leg	47	4.7
Tibiotarsus	45	4.5
Tarsometatarsus	7	0.7
Spinal, paralysis, neck	45	4.5
Total	1,000	

that have become injured or sick. Among the birds that are admitted to WRCs, injuries from perils placed by humans in their environment (e.g., windows, vehicles, feral cats) are responsible for a majority of the cases, especially for non-marine species. Our results especially illustrate the grave effects for non-marine bird populations that result from collisions with windows and vehicles, and predation from free-ranging cats. These three phenomena have drastic effects on many bird populations in the United States, where mortality is estimated at 80–340 million birds/year from collisions with vehicles (Loss et al. 2014b), between 100 million and 1 billion birds/year from collisions with windows and buildings (Loss et al. 2014a), and 1.3–5 billion birds/year from predation by cats (Loss et al. 2013).

Rates of mortality for marine bird species are more difficult to determine. In our sample, marine species almost always were found alive on the beach but too weak to fly. These birds were emaciated, with

Table 4. Types of illnesses and other non-trauma related causes recorded for bird specimens salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020.

Illness	n	%
Red tide	16	6.0
Botulism	15	5.6
Fungal or tumor	18	6.8
Not given	24	9.0
Sick or injured	35	13.2
Beached	135	50.8
Beached and injured	14	5.3
Hurricane or tropical storm	9	3.4
Total	266	

reduced flight muscles and organ distress. About 9% of these also had traumatic injuries, though some of these injuries may have occurred subsequent to becoming weak. Major factors affecting marine bird populations off Florida are sea surface temperature anomalies and tropical weather. When sea surface temperatures spike, fish populations often plummet, and the bird populations dependent on this resource become malnourished (e.g., Piatt et al. 2020). If they cannot find better conditions, these birds become too weak to fly and many wash up on beaches and are taken to WRCs. Tropical storms and hurricanes have great potential to harm bird populations (e.g., Huang et al. 2017). Winds may blow seabirds landward, and some species may travel hundreds of kilometers inland (e.g., Marantz and Kratter 1998). Severe storms may also disrupt ecosystem functioning and have lasting effects on fish prey bases of marine birds. In October 2013, Hurricane Sandy was thought to have severely disrupted fish populations in the northeastern United States. In the subsequent winter of 2013-2014, thousands of Razorbills (*Alca torda*) flew hundreds to thousands of kilometers south of their usual wintering areas and underwent incredible mortality (Diamond et al. 2020).

At a WRC in eastern Tennessee (Schenk and Souza 2014), a higher percentage of fatal injuries to birds was sustained from cats (48.3% vs. 25.4% in our study) and dogs (14.3% vs. 2.6% in our study) than we found in Florida. They found a nearly equal percentage of injuries took place from collisions with motor vehicles (26.7% vs. 26.1 % in our study). Schenk and Souza (2014) did not assess collisions with buildings and windows, which suggests that they may not be a major contributor to bird injuries in that area. The clinic in their study is in a mid-sized town surrounded by rural areas, and injuries from collisions with buildings and windows may be minimal compared to the much more urban clinics from which we received a majority of Florida specimens. A rural setting may also increase the likelihood of lethal encounters with cats and dogs.

Molina-López et al. (2017) reported a different situation with WRCs in Spain, where most (41%) of the birds brought to WRCs were found in illegal captivity and confiscated by wildlife authorities. Although this is an issue with a few species in the United States, particularly Painted Buntings (*Passerina ciris*) in south Florida (Sykes et al. 2006), this problem is much more extensive in Spain, where finches in particular are trapped for singing competitions. In Spain, another large percentage of cases (33%) was orphaned young birds. In the sample of specimens for this study, we had only four cases of orphaned young birds. Because, they often make poor skin or skeletal specimens, we typically do not accept non-volant young of common species at the FLMNH, although these cases are common at the WRCs from which

we received specimens. Of the remaining cases in Spain, trauma accounted for 70% of cases, illness accounted for 15%, and misplaced birds found in human living spaces accounted for 15%. The percentage of cases involving illness was similar to ours, but they had somewhat fewer cases involving trauma.

As mentioned in the methods, the sample of specimens used in this study has some strong biases. First, the injuries or illnesses had to be lethal. It is the mission of the WRCs to rehabilitate and release the birds that arrive at their facilities. We do not know whether released birds have an elevated mortality rate compared to others of their species. Another bias is that many common species are underrepresented simply because we do not have the staff time to prepare them. Our necessary system of triage eliminated most individuals of common large species such as the Common Gallinule (*Gallinula galeata*), American Coot (*Fulica americana*), Common Loon (*Gavia immer*), American Anhinga (*Anhinga anhinga*), Great Blue Heron (*Ardea herodias*), Great Egret (*Arda alba*), Cattle Egret (*Bubulcus ibis*), Yellow-crowned Night-Heron (*Nyctanassa violacea*), Red-shouldered Hawk (*Buteo lineatus*), Red-tailed Hawk (*Buteo jamaicensis*), Barred Owl (*Strix varia*), and Great Horned Owl (*Bubo virginianus*). Even for some smaller species that are retrieved abundantly at WRCs (e.g., Red-bellied Woodpecker [*Melanerpes carolinus*], Blue Jay [*Cyanocitta cristata*], Gray Catbird [*Dumetella carolinensis*], Ovenbird [*Seiurus aurocapilla*], Common Yellowthroat [*Geothlypis trichas*], and American Redstart [*Setophaga ruticilla*]), we are unable to process all incoming specimens. Our study could be improved with substantial additional staffing to pick up birds more regularly and to dissect and analyze a larger proportion of them. Often particular species may be dedicated to other institutions or organizations. For instance, during the red tide outbreak of 2018–2019, biologists with the Florida Fish and Wildlife Commission collected dead birds from WRCs to screen for red tide poisoning. We are unaware of their findings.

Species probably vary considerably in their susceptibility to illness or injury that lands them in WRCs. Among passerines, some long-distance migrating species appear be particularly susceptible to injuries (e.g., the Neotropical migrants Common Yellowthroat, American Redstart, Black-throated Blue Warbler [*Setophaga caerulescens*], and Black-and-white Warbler [*Mniotilta varia*]) compared to species that seem to be just as common (e.g., the winter resident Yellow-rumped Warbler [*Setophaga coronata*], or the resident Tufted Titmouse [*Baeolophus bicolor*] or Carolina Chickadee [*Poecile carolinensis*]). Migrant species may be at greater risk of mortality because twice a year (during migrations) they are in completely unfamiliar environments and have not learned the

local landscape of predators and other dangers. Many residents and winter resident species, on the other hand, remain in the same area for months, which allows them time to learn the dangers in the landscape. Among waterbirds, shorebirds (Scolopacidae, Charadriidae), nearly all of which we prepare as specimens, appear less susceptible to injury than other taxa. These species live in environments with fewer hazards than terrestrial ecosystems (buildings, vehicles, free ranging cats). In addition, they are primarily found on beaches, marshes, and mudflats in Florida, which are mostly inaccessible for people, and mortality may be under-recorded simply because the injured or sick birds are not found and brought to WRCs. We hope that our research will provide a springboard for future studies of avian mortality that are more comprehensive in geographic coverage and more detailed in their necropsies.

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Appendix 1. Species and sample sizes of birds salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020, used in this study. An asterisk (*) indicates common species undersampled in this study; two asterisks (**) indicate a common species oversampled in this study.

English name	Scientific name	Number of specimens
Anseriformes		
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	3
Canada Goose	*Branta canadensis*	1
Wood Duck	*Aix sponsa*	3
Blue-winged Teal	*Spatula discors*	6
Northern Shoveler	*Spatula clypeata*	1
American Wigeon	*Mareca americana*	1
Mottled Duck	*Anas fulvigula*	1
Mottled Duck x Mallard	*Anas fulvigula x platyrhynchos*	4
Green-winged Teal	*Anas crecca*	2
Redhead	*Aythya americana*	4
Ring-necked Duck	*Aythya collaris*	1
Greater Scaup	*Aythya marila*	1
Lesser Scaup	*Aythya affinis*	3
Common Eider	*Somateria mollissima*	1
Surf Scoter	*Melanitta perspicillata*	2
White-winged Scoter	*Melanitta deglandi*	1
Black Scoter	*Melanitta americana*	3
Bufflehead	*Bucephala albeola*	4
Hooded Merganser	*Lophodytes cucullatus*	1
Masked Duck	*Nomonyx dominicus*	1
Ruddy Duck	*Oxyura jamaicensis*	3
Galliformes		
Northern Bobwhite	*Colinus virginianus*	1
Indian Peafowl	*Pavo cristatus*	1
Common Quail	*Coturnix coturnix*	1
Grebes		
Pied-billed Grebe	*Podilymbus podiceps*	4
Horned Grebe	*Podiceps auritus*	6
Pigeons, doves		
White-crowned Pigeon	*Patagioenas leucocephala*	7
Common Ground Dove	*Columbina passerina*	7
White-winged Dove	*Zenaida asiatica*	2
Mourning Dove*	*Zenaida macroura*	3
Cuckoos		
Smooth-billed Ani	*Crotophaga ani*	1
Yellow-billed Cuckoo	*Coccyzus americanus*	24
Mangrove Cuckoo	*Coccyzus minor*	1
Black-billed Cuckoo	*Coccyzus erythropthalmus*	3
Nightjars		
Common Nighthawk**	*Chordeiles minor*	18

Appendix 1. (Continued) Species and sample sizes of birds salvaged at wildlife rehabilitation clinics in Florida, USA, 2015–2020, used in this study. An asterisk (*) indicates common species undersampled in this study; two asterisks (**) indicate a common species oversampled in this study.

	English name	Scientific name	Number of specimens
	Antillean Nighthawk	*Chordeiles gundlachii*	1
	Chuck-wills-widow**	*Antrostomus carolinensis*	16
	Eastern Whip-poor-will	*Antrostomus vociferus*	7
Swifts			
	Chimney Swift	*Chaetura pelagica*	15
Hummingbirds			
	Ruby-throated Hummingbird	*Archilochus colubris*	13
Rails			
	King Rail	*Rallus elegans*	4
	Clapper Rail**	*Rallus crepitans*	21
	Virginia Rail**	*Rallus limicola*	18
	Sora**	*Porzana carolina*	16
	Common Gallinule	*Gallinula chloropus*	2
	American Coot*	*Fulica americana*	3
	Purple Gallinule**	*Porphyrio martinicus*	14
	Purple Swamphen	*Porphyrio porphyrio*	2
	Yellow Rail	*Coturnicops noveboracensis*	1
Limpkins			
	Limpkin	*Aramus guarauna*	8
Avocets, stilts			
	Black-necked Stilt	*Himantopus mexicanus*	3
	American Avocet	*Recurvirostra americana*	2
Oystercatchers			
	American Oystercatcher	*Haematopus palliatus*	3
Plovers			
	Black-bellied Plover	*Pluvialis squatarola*	5
	Killdeer	*Charadrius vociferus*	7
	Semipalmated Plover	*Charadrius semipalmatus*	3
	Piping Plover	*Charadrius melodus*	4
	Wilson's Plover	*Charadrius wilsonia*	1
	Snowy Plover	*Charadrius nivosus*	1
Sandpipers			
	Ruddy Turnstone	*Arenaria interpres*	16
	Red Knot	*Calidris canutus*	6
	Sanderling	*Calidris alba*	16
	Dunlin	*Calidris alpina*	5
	Least Sandpiper	*Calidris minutilla*	4
	Semipalmated Sandpiper	*Calidris pusilla*	1
	Short-billed Dowitcher	*Limnodromus griseus*	5

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	English name	Scientific name	Number of specimens
	American Woodcock	*Scolopax minor*	3
	Wilson's Snipe**	*Gallinago delicata*	11
	Spotted Sandpiper	*Actitis macularius*	2
	Solitary Sandpiper	*Tringa solitaria*	2
	Lesser Yellowlegs	*Tringa flavipes*	1
	Willet	*Tringa semipalmata*	5
	Red-necked Phalarope	*Phalaropus lobatus*	10
	Red Phalarope	*Phalaropus fulicarius*	10
Jaegers			
	Pomarine Jaeger	*Stercorarius pomarinus*	4
	Parasitic Jaeger	*Stercorarius parasiticus*	4
	Long-tailed Jaeger	*Stercorarius longicaudus*	3
Alcids			
	Thick-billed Murre	*Uria lomvia*	1
	Razorbill	*Alca torda*	4
Gulls and terns			
	Black-legged Kittiwake	*Rissa tridactyla*	2
	Bonaparte's Gull	*Chroicocephalus philadelphia*	10
	Laughing Gull**	*Leucophaeus atricilla*	20
	Ring-billed Gull	*Larus delawarensis*	1
	Herring Gull	*Larus argentatus*	11
	Lesser Black-backed Gull	*Larus fuscus*	7
	Great Black-backed Gull	*Larus marinus*	6
	Brown Noddy	*Anous stolidus*	10
	Sooty Tern	*Onychoprion fuscatus*	23
	Bridled Tern	*Onychoprion anaethetus*	17
	Least Tern	*Sternula antillarum*	15
	Gull-billed Tern	*Gelochelidon nilotica*	1
	Caspian Tern	*Hydroprogne caspia*	1
	Black Tern	*Chlidonias niger*	2
	Roseate Tern	*Sterna dougallii*	3
	Common Tern	*Sterna hirundo*	19
	Arctic Tern	*Sterna paradisaea*	1
	Royal Tern	*Thalasseus maximus*	3
	Sandwich Tern**	*Thalasseus sandvicensis*	15
	Black Skimmer	*Rynchops niger*	7
Tropicbirds			
	White-tailed Tropicbird	*Phaethon lepturus*	7
	Red-billed Tropicbird	*Phaethon aethereus*	1
Loons			
	Red-throated Loon	*Gavia stellata*	3

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English name	Scientific name	Number of specimens
Common Loon*	*Gavia immer*	2
Storm petrels		
Leach's Storm-Petrel	*Hydrobates leucorhous*	4
Band-rumped Storm-Petrel	*Hydrobates castro*	2
Shearwaters		
Northern Fulmar	*Fulmarus glacialis*	2
Black-capped Petrel	*Pterodroma hasitata*	1
Cory's Shearwater**	*Calonectris diomedea*	18
Sooty Shearwater	*Ardenna grisea*	3
Great Shearwater	*Ardenna gravis*	9
Manx Shearwater	*Puffinus puffinus*	3
Audubon's Shearwater	*Puffinus lherminieri*	13
Frigatebirds		
Magnificent Frigatebird	*Fregata magnificens*	4
Boobies and gannets		
Masked Booby	*Sula dactylatra*	4
Brown Booby	*Sula leucogaster*	9
Red-footed Booby	*Sula sula*	2
Northern Gannet	*Morus bassanus*	1
Anhingas		
Anhinga*	*Anhinga anhinga*	4
Cormorants		
Great Cormorant	*Phalacrocorax carbo*	1
Pelicans		
American White Pelican	*Pelecanus erythrorhynchos*	3
Herons and egrets		
American Bittern	*Botaurus lentiginosus*	4
Least Bittern**	*Ixobrychus exilis*	19
Great Blue Heron*	*Ardea herodias*	8
Great Egret*	*Ardea alba*	2
Snowy Egret	*Egretta thula*	5
Little Blue Heron*	*Egretta caerulea*	3
Tricolored Heron	*Egretta tricolor*	7
Reddish Egret	*Egretta rufescens*	2
Cattle Egret*	*Bubulcus ibis*	3
Green Heron**	*Butorides virescens*	13
Black-crowned Night-Heron	*Nycticorax nycticorax*	4
Yellow-crowned Night-Heron*	*Nyctanassa violacea*	6

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English name	Scientific name	Number of specimens
Ibis and spoonbills		
White Ibis*	*Eudocimus albus*	3
Glossy Ibis	*Plegadis falcinellus*	5
Roseate Spoonbill	*Platalea ajaja*	7
Hawks, eagles, kites		
Osprey*	*Pandion haliaetus*	4
Swallow-tailed Kite	*Elanoides forficatus*	10
Northern Harrier	*Circus hudsonius*	3
Sharp-shinned Hawk**	*Accipiter striatus*	12
Cooper's Hawk*	*Accipiter cooperii*	15
Bald Eagle	*Haliaeetus leucocephalus*	2
Mississippi Kite	*Ictinia mississippiensis*	16
Snail Kite	*Rostrhamus sociabilis*	7
Red-shouldered Hawk*	*Buteo lineatus*	12
Broad-winged Hawk	*Buteo platypterus*	14
Short-tailed Hawk	*Buteo brachyurus*	2
Red-tailed Hawk*	*Buteo jamaicensis*	7
Barn owls		
Barn Owl	*Tyto furcata*	4
Owls		
Flammulated Owl	*Psiloscops flammeolus*	1
Eastern Screech-Owl**	*Megascops asio*	26
Great Horned Owl	*Bubo virginianus*	7
Burrowing Owl**	*Athene cunicularia*	14
Long-eared Owl	*Asio otus*	1
Kingfishers		
Belted Kingfisher**	*Megaceryle alcyon*	26
Woodpeckers		
Red-headed Woodpecker	*Melanerpes erythrocephalus*	6
Red-bellied Woodpecker	*Melanerpes carolinus*	15
Yellow-bellied Sapsucker**	*Sphyrapicus varius*	28
Downy Woodpecker	*Dryobates pubescens*	13
Northern Flicker	*Colaptes auratus*	5
Pileated Woodpecker	*Dryocopus pileatus*	11
Falcons		
Crested Caracara	*Caracara cheriway*	4
American Kestrel**	*Falco sparverius*	28
Merlin	*Falco columbarius*	20
Peregrine Falcon	*Falco peregrinus*	17

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	English name	Scientific name	Number of specimens
Parrots			
	Monk Parakeet	*Myiopsitta monachus*	2
	Nanday Parakeet	*Aratinga nenday*	1
	Blue-crowned Parakeet	*Thectocercus acuticaudatus*	1
	Mitred Parakeet	*Psittacara mitratus*	1
	Red-masked Parakeet	*Psittacara erythrogenys*	1
Flycatchers			
	Great Crested Flycatcher	*Myiarchus crinitus*	7
	Sulfur-bellied Flycatcher	*Myiodynastes luteiventris*	1
	Eastern Kingbird	*Tyrannus tyrannus*	4
	Gray Kingbird	*Tyrannus dominicensis*	6
	Eastern Wood-Pewee	*Contopus virens*	3
	Yellow-bellied Flycatcher	*Empidonax flaviventris*	1
	Acadian Flycatcher	*Empidonax virescens*	1
	Willow Flycatcher	*Empidonax traillii*	1
	Eastern Phoebe	*Sayornis phoebe*	11
Shrikes			
	Loggerhead Shrike	*Lanius ludovicianus*	13
Vireos			
	White-eyed Vireo	*Vireo griseus*	9
	Yellow-throated Vireo	*Vireo flavifrons*	5
	Blue-headed Vireo	*Vireo solitarius*	6
	Philadelphia Vireo	*Vireo philadelphicus*	1
	Red-eyed Vireo	*Vireo olivaceus*	11
	Black-whiskered Vireo	*Vireo altiloquus*	2
Jays, crows			
	Blue Jay**	*Cyanocitta cristata*	27
	Florida Scrub-Jay	*Aphelocoma coerulescens*	1
	American Crow*	*Corvus brachyrhynchos*	3
	Fish Crow	*Corvus ossifragus*	6
Swallows, martins			
	Bank Swallow	*Riparia riparia*	2
	Tree Swallow	*Tachycineta bicolor*	4
	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	3
	Purple Martin	*Progne subis*	11
	Barn Swallow	*Hirundo rustica*	12
	Cliff Swallow	*Petrochelidon pyrrhonota*	1
	Cave Swallow	*Petrochelidon fulva*	1

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English name	Scientific name	Number of specimens
Titmice, chickadees		
Carolina Chickadee	*Poecile carolinensis*	4
Tufted Titmouse	*Baeolophus bicolor*	3
Wrens		
House Wren	*Troglodytes aedon*	1
Sedge Wren	*Cistothorus platensis*	6
Marsh Wren	*Cistothorus palustris*	5
Carolina Wren	*Thryothorus ludovicianus*	10
Gnatcacthers		
Blue-gray Gnatcatcher	*Polioptila caerulea*	10
Kinglets		
Ruby-crowned Kinglet	*Regulus calendula*	5
Thrushes		
Eastern Bluebird**	*Sialia sialis*	26
Veery	*Catharus fuscescens*	5
Gray-cheeked Thrush	*Catharus minimus*	6
Swainson's Thrush	*Catharus ustulatus*	11
Hermit Thrush	*Catharus guttatus*	7
Wood Thrush	*Hylocichla mustelina*	14
American Robin	*Turdus migratorius*	6
Thrashers		
Gray Catbird	*Dumetella carolinensis*	17
Brown Thrasher	*Toxostoma rufum*	17
Bahama Mockingbird	*Mimus gundlachii*	1
Northern Mockingbird	*Mimus polyglottos*	20
Starlings, mynas		
Common Hill Myna	*Gracula religiosa*	1
European Starling	*Sturnus vulgaris*	8
Waxwings		
Cedar Waxwing**	*Bombycilla cedrorum*	19
Wydahs		
Pin-tailed Wydah	*Vidua macroura*	1
Finches, munias		
Scaly-breasted Munia	*Lonchura punctulata*	9
White-rumped Munia	*Lonchura striata*	1
Old World sparrows		
House Sparrow	*Passer domesticus*	7

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	English name	Scientific name	Number of specimens
Finches			
	House Finch	*Haemorhous mexicanus*	13
	Purple Finch	*Haemorhous purpureus*	1
	American Goldfinch	*Spinus tristis*	12
Emberizid sparrows			
	Bachman's Sparrow	*Peucaea aestivalis*	1
	Grasshopper Sparrow	*Ammodramus savannarum*	1
	Chipping Sparrow	*Spizella passerina*	2
	White-throated Sparrow	*Zonotrichia albicollis*	3
	Nelson's Sparrow	*Ammospiza nelsoni*	1
	Song Sparrow	*Melospiza melodia*	1
	Swamp Sparrow	*Melospiza georgiana*	4
	Eastern Towhee	*Pipilo erythrophthalmus*	1
Chats			
	Yellow-breasted Chat	*Icteria virens*	4
Blackbirds			
	Bobolink	*Dolichonyx oryzivorus*	2
	Eastern Meadowlark	*Sturnella magna*	4
	Orchard Oriole	*Icterus spurius*	2
	Spot-breasted Oriole	*Icterus pectoralis*	9
	Baltimore Oriole	*Icterus galbula*	2
	Red-winged Blackbird**	*Agelaius phoeniceus*	14
	Brown-headed Cowbird**	*Molothrus ater*	11
	Common Grackle**	*Quiscalus quiscula*	10
	Boat-tailed Grackle**	*Quiscalus major*	11
Wood warblers			
	Ovenbird	*Seiurus aurocapilla*	15
	Worm-eating Warbler	*Helmitheros vermivorum*	8
	Louisiana Waterthrush	*Parkesia motacilla*	2
	Northern Waterthrush	*Parkesia noveboracensis*	7
	Black-and-white Warbler	*Mniotilta varia*	17
	Prothonotary Warbler	*Protonotaria citrea*	18
	Swainson's Warbler	*Limnothlypis swainsonii*	3
	Tennessee Warbler	*Leiothlypis peregrina*	3
	Orange-crowned Warbler	*Leiothlypis celata*	1
	Connecticut Warbler	*Oporornis agilis*	2
	Mourning Warbler	*Geothlypis philadelphia*	1
	Kentucky Warbler	*Geothlypis formosa*	3
	Common Yellowthroat	*Geothlypis trichas*	8
	Hooded Warbler	*Setophaga citrina*	9

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English name	Scientific name	Number of specimens
American Redstart	*Setophaga ruticilla*	25
Cape May Warbler	*Setophaga tigrina*	14
Northern Parula	*Setophaga americana*	12
Magnolia Warbler	*Setophaga magnolia*	3
Bay-breasted Warbler	*Setophaga castanea*	3
Blackburnian Warbler	*Setophaga fusca*	1
Yellow Warbler	*Setophaga petechia*	3
Chestnut-sided Warbler	*Setophaga pensylvanica*	3
Blackpoll Warbler	*Setophaga striata*	7
Black-throated Blue Warbler	*Setophaga caerulescens*	23
Palm Warbler	*Setophaga palmarum*	21
Pine Warbler	*Setophaga pinus*	12
Yellow-rumped Warbler	*Setophaga coronata*	13
Yellow-throated Warbler	*Setophaga dominica*	8
Prairie Warbler	*Setophaga discolor*	10
Black-throated Green Warbler	*Setophaga virens*	1
Canada Warbler	*Cardellina canadensis*	1
Wilson's Warbler	*Cardellina pusilla*	1
Cardinals, buntings, grosbeaks		
Summer Tanager	*Piranga rubra*	7
Scarlet Tanager	*Piranga olivacea*	7
Northern Cardinal	*Cardinalis cardinalis*	15
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	7
Blue Grosbeak	*Passerina caerulea*	3
Indigo Bunting	*Passerina cyanea*	13
Painted Bunting	*Passerina ciris*	13
Dickcissel	*Spiza americana*	2