Supplementary Information to Accompany Doctoral Dissertation of Rossy Natale Entitled "Using Ecomorphology to Understand the Evolutionary History and Spatial Biodiversity of Wading Birds"

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Specimens 3D scanned for analyses in Chapter 2 and 3

The table below contains additional details of the specimens used throughout Chapter 2 and 3 of this dissertation. Included is the species name, the specimen number (FMNH= Field Museum of Natural History; ROM= Royal Ontario Museum; USNM = Smithsonian Museum of Natural History; LACM= Natural History Museum of Los Angeles County), any modifications done on the landmark data set (the number here denotes the number of landmarks), available specimen information, and the additional sources (see methods of Chapter 2) used for each species to determine foraging mode. The 'specimen information' is taken verbatim from vertnet.org and includes available information on collector, sex, body mass, location and date of collection. Scans of each specimen and more detailed scanner information are available on the Morphosource online database. "Mini" denotes Capture Mini desktop structured light scanner (3D Systems, North Carolina) and "Zeiss" refers to the Comet L3D blue light scanner (Carl Zeiss, Germany) with '75' an '250' denoting which lens was used with the two differing in their field of view. The 75 field of view lens has 0.03mm point spacing while the 250 field of view lens has 0.10 mm

point spacing. An asterisk next to a reference denotes the source was from an online video. The references for these online videos are available in this online supplement under ”Online Video References”. The surface scans for all specimens from which landmark data was collected are available on the morphosource data repository(morphosource project ID: 00000C909).

Table 1: Summary of each specimen used in this study.

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Actitis hypoleucos	FMNH 368856		Female Kenya, Eastern Lake Rudolf, El Molo Bay 23 Oct 1958	Zeiss 75	Hammer et al. (2013)
Actitis hypoleucos	FMNH 338296		Israel, Tel Aviv	Zeiss 75	
Actitis macularia	FMNH 466213		Female Captive; Bay Beach Wildlife Sanctuary 23 Dec 2007	Zeiss 75	
Actitis macularia	FMNH 379170		Female North America, Mexico, Michoacan: Lake Chapala 1-17-1949	Zeiss 75	
Actophilornis africanus	FMNH 368823		Female Kenya, Eastern Lake Rudolf, North End of Omo River Delta 22 Jan 1959	Zeiss 75	Ameha (2018)
Actophilornis africanus	FMNH 93434		Female French Sudan Cl. de Bamako satuba 7 km E	Zeiss 75	
Aethia cristatella	LACM 117830		North America, United States, Alaska, Bering Sea, 51 57 N, 174 24 E 06 July 1983	Mini	Hunt Jr et al. (1998)
Aethia cristatella	LACM 117834		Male North America, United States, Alaska, Bering Sea, 51 57 N, 174 24 E 06 July 1983	Mini	
Aethia psittacula	LACM 107192	4 landmarks mirrored	Hunt, G.L Female 300G Bering Sea, North Pacific, 64 50 N, 168 49 W 07 July 1984	Mini	Hunt Jr et al. (1998)
Aethia psittacula	LACM 102621		Heyning, J.E Male 295g North Pacific 51 06 N 173 33 E 30 Jun 1982	Mini	
Aethia pusilla	USNM 638874		Female North Pacific Ocean 5100 N, 17600E' 15 Feb 1965	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Aethia pusilla	ROM 0150380		Male 101.5g Troy, D.M. North America, USA; Alaska, Aleutians West, St. George Island Pribilof Islands, 572400N;1693803W 1984-07-01	Mini	
Aethia pygmaea	USNM 344544	7 mirrored	A. Hrdlicka 1937 North America, United States, Alaska, Aleutians West Census Area	Mini	
Aethia pygmaea	LACM 110691	6 mirrored, 4 estimated	Hunt, G.L. Female Bering Sea, North Pacific, 52 27N, 175 41 E 03 Aug 1993	Mini	
Alca torda	LACM 103474		Male Europe, Holland, Oostvoorne 51 55 N, 004 07 E 1980	Mini	
Alca torda	FMNH 376712		North America, USA, New York, Suffolk Co: Montauk	Zeiss 250	
Alle alle	FMNH 105265		Female North America, Greenland, Liverpool Land, Rathbones Id. 1936-08-06	Zeiss 75	Enstipp et al. (2018)
Alle alle	FMNH 376328	1 mirrored, 1 estimated	North America, USA, Florida, Dade Co; Miami Beach December 1936	Zeiss 75	
Anarhynchus frontalis	ROM 141502	1 mirrored	Baker, A.J. Oceania, New Zealand, Auckland, Manukau Harbour, -36.9686467, 174.6936035 Febuary 1984	Mini	Wittington (2015)
Anous minutus	FMNH 346130		Female Aurstralasia, Micronesia, Marshall Is, Enewetak Atoll, Rigili 1988-07-30	Zeiss 75	
Anous minutus	FMNH 346127		Female Aurstralasia, Micronesia, Marshall Is, Enewetak Atoll, Rigili 1988-07-30	Zeiss 75	
Anous stolidus	LACM 117750		Herbert, E. Australia, New South Wales, Heron Island 05 January 1974	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Anous stolidus	FMNH 346102		Female Australia, Micronesia, Marshall Is, Enewetak Atoll, Bogombogo 1988-08-01	Zeiss 75	
Aphriza virgata	FMNH 334729		Male North America, USA, Alaska, Orca Inlet, 9 mi S Cordova, 60.5230541, -145.866669 1987-5-13	Zeiss 75	
Aprhiza virgata	USNM 489303	46 estimate, 46 mirrored	R. Mccaskie Female North America, US, California, Riverside, Desert Beach, Salton Sea 26 April 1967	Mini	
Arenaria interpres	FMNH 313996		Polynesia, Midway Island December 1959	Zeiss 75	Fraser et al. (2010)
Arenaria melanocephala	ROM 115678	46 mirrored	Male 113.1g North America, USA, Alaska, Wade Hampton, Kolomak River, 61.7120514, -165.6895142 1968-07-07	Mini	
Arenaria melanocephala	FMNH 364720		Male USA, California, San Francisco Co; Farallon Island 1981-09-23	Zeiss 75	
Attagis gayi	FMNH 105920		Male South America, Peru, San Antonia de Esquilache 1939-09-22	Zeiss 75	Korzun et al. (2009)
Attagis malouinus	USNM 490853	29 mirrored	Male South America, Argentina, Tierra Del Fuego, Bahia San Sebastian 29 April 1971	Mini	Korzun et al. (2009)
Bartramia longicauda	ROM 110807		Dick, J.A. Male 121.4g North America; Canada; Saskatchewan; Piapot Rural Municipality 500000N; 1091100W 1971-07-16	Mini	Shaffer et al. (2019)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Bartramia longicauda	FMNH 376174	7 mirrored	Female North America, USA, Florida, Dade Co: SW 232nd St at 109th Ave, 22.5516567, -80.3679943 1959-08-22	Zeiss 75	
Brachyramphus brevirostris	USNM 288086	7 mirrored	Female North America, United States, Alaska, Skagway-Yakutat-Angoon C. A., Glacier Bay, Willoughby Island, Near 1921-08-05	Mini	Day and Nigro (2000)
Brachyramphus brevirostris	LACM 110518	15 estimated	Guthrie, D.A. Exxon-Valdez Oil Spill North America, Alaska, Homer, 59.6423912, -151.5501251 April 1989	Mini	
Brachyramphus marmoratus	USNM 557617		Female North America, United States, California, Humboldt, Humboldt Inlet, Off Shore South 25 August 1982	Mini	Kuletz (2005)
Brachyramphus marmoratus	FMNH 348355	7 mirrored	North America, USA, Washington, San Juan Co: San Juan Is, 48.5409323, -123.0860158 1953-07-08	Zeiss 75	
Burhinus bistriatus	FMNH 289831		Captive 27.2085338, -81.3602829 1979-02-28	Zeiss 250	Marín E et al. (2012)
Burhinus bistriatus	LACM 87072		Catalina Bird Park 1941-09-28	Mini	
Burhinus capensis	LACM 117292		Female Africa, South Africa, Free state, Bloemfontein, Ferreira 15 Sep 1987	Mini	My Bonsai Obsession (2009)*
Burhinus capensis	FMNH 390778	51 mirrored, 2 estimated	Africa, South Africa, Barberspen, Angling Resort 1977-07-08	Zeiss 75	
Burhinus (Esacus) magnirostris	USNM 19649	6 mirrored	Asia, Myanmar, Sullivan 1900-02-04	Mini	Birding with Nick Upton (2019)*
Burhinus magnirostris	FMNH 104795		Female Captive 1947-06	Zeiss 75	
Burhinus oedicnemus	FMNH 104449		Female Captive 1942-10-23	Zeiss 250	Green et al. (2000)

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Burhinus senegalensis	FMNH 368869	7 mirrored, 1 estimated	Male Africa, Kenya, Eastern: Lake Rudolf, North Island 1959-01-12	Zeiss 75	
Burhinus sengalensis	USNM 553053	30 mirrored	Male Pms and C. Seymour Africa, Egypt, Port Said, 2km W 1967-05-14	Mini	
Burhinus supercilliaris	LACM 109827	14 estimated	Campbell, K.E. Female 451.7g South America, Peru, Piura Dept. Sechura, 10 Mi E 15 April 1970	Mini	
Burhinus supercilliaris	ROM 159572		Female 470g South America; Chile, Tarapaca, Rio Lluta Valley -19.3988363, -70.00007629 1995-07-27	Mini	
Burhinus vermiculatus	FMNH 342526		Female Captive 1985-09-12	Zeiss 250	Shenton Safaris (2018)*
Burhinus vermiculatus	ROM 156978	1 estimated	Road kill, Africa, South Africa, Kwazulu-Natal, 8 km from St. Lucia, Cape Vidal Rd. -28.1354261, 32.547554 1991-02-03	Mini	
Calidris acuminata	USNM 638728	46 mirrored		Mini	Jing et al. (2007)
Calidris acuminata	ROM 137943	3 estimated	Gill, R. Male 72.5g North America, USA, Alaska, Wade Hampton, Kaskunuk River, 61.6481625, -164.3444824 1979-09-19	Mini	
Calidris alba	FMNH 483004		North America, USA, Illinois, Cook Co., Chicago, Montrose Beach, 41.964285, -87.636266 2012-07-30	Zeiss 75	
Calidris alba	FMNH 341863		Female North America, USA, Louisiana, Cameron Par, Cameron, 5 km E 1988-04-29	Zeiss 75	
Calidris alpina	FMNH 351273		Female North America, USA, Wisconsin, Brown Co: Green Bay, 44.8986169, -89.5674821 1990-09-16	Zeiss 75	Rob Curtis (2020)*

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Calidris alpina	FMNH 376252	3 mirrored, 4 estimated	North America, USA, New Jersey, Ocean Co: Barnegat 1924-11-08	Zeiss 75	
Calidris bairdii	FMNH 105040		Male North America, USA, Illinois, Cook Co, Chicago, Lake Calumet 41.6804352, -87.5826492 1935-09-15	Zeiss 75	Philip Parson's (2014)*
Calidris bairdii	FMNH 93225		North America, USA, Illinois, Cook Co: Calumet Lake 41.6741, -87.5827 1933-10-01	Zeiss 75	
Calidris canutus	FMNH 376221		Female North America, USA, Virginia, Northampton Co: Hog Island 37.4165272, -75.6937408 1929-06-16	Zeiss 75	
Calidris canutus	FMNH 363893		Male Europe, The Netherlands, Noord Brabant: Bergen op Zoom 1989-09	Zeiss 75	
Calidris ferruginea	FMNH 368863		Female Africa, Kenya, Eastern: Lake Rudolf, Malkanyacha 1959-01-14	Zeiss 75	Amar-Singh HSS (2014)*
Calidris fuscicollis	FMNH 317851		Female North America, USA, Kansas, Douglas Co: Kansas River at Lakeview, 39.0265186, -95.2869129 1965-05-14	Zeiss 75	Hernandez and Bala (2007)
Calidris fuscicollis	FMNH 376240		North America, USA, Florida, Dade Co: SW 224th St at 87th Ave 1959-05-17	Zeiss 75	
Calidris himantopus	LACM 114330	94 estimated	Garrett, K.L. North America, United States, California, Imperial Co, Salton Sea; Hazard Rd, W End 33 19 32 N, 115 49 53 W 17 SEP 2006	Mini	Tavovalero (2015)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Calidris himantopus	ROM 109502	1 mirrored, 103 estimated	Female North America; Canada; Manitoba; Northern Region, 58.7325792, -93.418808 1997-06-10	Mini	
Calidris maritima	ROM 0141203	94 estimated	Dick, J.A. Male 60.5g North America; Canada; New Brunswick; Charlotte County, Indian Point, near St. Andrews 45.0691562, -67.0382308 1980-12-16	Mini	Birdfun (2018)*
Calidris maritima	ROM 0150964	1 estimated	Sibley, F. Female 77.6g North America; USA; Connecticut; New Haven County, 411829N;0725543W 1985-04-12	Mini	
Calidris mauri	FMNH 342546		Male North America, USA, Florida, Collier Co., Marco Id., 26.1601353, -81.3607445 1987-08-01	Zeiss 75	Van Remsen (2017)*
Calidris mauri	FMNH 360227	2 estimated	Male North America, USA, Florida, Collier Co: Marco Id, 26.1601353, -81.3607445 1989-01-08	Zeiss 75	
Calidris melanotos	FMNH 85720		North America, USA, Illinois, DuPage Co: Warrenville 41.8178101, -88.1734009 1912-04-10	Zeiss 75	Liron Gertsman (2014)*
Calidris melanotos	FMNH 105111		Female North America, USA, Illinois, Cok Co, Chicago; Lake Calumet 41.6804352, -87.5826492 1936-08-30	Zeiss 75	
Calidris minuta	FMNH 368861		Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1959-02-05	Zeiss 75	Masero et al. (2000)
Calidris minuta	FMNH 363894	1 mirrored, 53 estimated	Female Europe, The Netherlands, Zeeland: Philipsdam 1985-09-27	Zeiss 75	

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Calidris minutilla	FMNH 105220		Male North America, USA; Illinois, Cook Co; Chicago, Lake Calumet 41.6804352, -87.5826492 1936-07-28	Zeiss 75	Van Remsen (2017)
Calidris minutilla	FMNH 105218		Female North America, USA, Illinois, Cook Co, Chicago, Lake Calumet 41.6804352, -87.5826492 1936-07-28	Zeiss 75	
Calidris ptilocnemis	USNM 224073	49 mirrored	W. Palmer North America, United States, Alaska, Aleutians West Census Area, St. Paul Islands, Pribilof Islands 12 July 1890	Mini	Dianab97330 (2014)*
Calidris ptilocnemis	ROM 122452	48 estimated, 46 mirrored	Rising, J.D. Male 59.2g North America; USA; Alaska; Aleutians West, NE Umnak Island, Fox Islands, Aleutian Island 531326N; 1682556W 1974-06-29	Mini	
Calidris pusilla	FMNH 290821	2 mirrored	North America, USA, Illinois, Cook Co, Chicago: Lake Calumet, 41.6804352, -87.5826492 1980-08-06	Zeiss 75	Mark Vance (2012)*
Calidris pusilla	FMNH 105215		Female North America, USA, Illinois, Cook Co; Chicago, Lake Calumet 41.6804352, -87.5826492 1936-07-28	Zeiss 75	
Calidris ruficollis	ROM 136257	2 estimated	Bakers, A.J. Female 36g Oceania; Australia; Tasmania, Greens Beach. 410511S;1464430E 1979-03-22	Mini	Ramos (2017)*
Calidris ruficollis	ROM 0152134	53 mirrored	Baker, A.J. and Peck, M.K. Male 30.1g Oceania, Australia; Victoria Corinella Peninsula, 382452S;1452530E 1985-12-05	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Calidris tenurostris	ROM 0152163	1 mirrored, 13 estimated	Baker, A.J. and Peck. M.K. and georeferenced by Bradley G. Millen Female 156g Oceania: Australia; Queensland 272500S; 1530900E 1985-12-11	Mini	Kaustav Kahn (2019)*
Catharacta antarctica	LACM 112533	13 estimated	Sea World San Diego, Aviary Bird 22 April 1984	Mini	
Catharacta maccormicki	USNM 430484		Male 1957-02-01	Mini	
Catharacta maccormicki	LACM 102398	6 mirrored	Fry, J. Female Antarctica, Ross Sea, Victoria Land, Scott Base, -77.83, 166.42 December 1982		
Catharacta skua	LACM 102400	5 mirrored, 2 estimated	Crockett, D.E. Oceania, South Pacific, New Zealand ,North Island, Whangarei, 35 43 S, 174 19 E 1982	Mini	Jakubas et al. (2018)
Catharacta skua	ROM 157280		Baker, A.J. and Peck. M.K. and georeferenced by Bradley G. Millen Female 1500g Europe; Iceland; Austurland, Hof, 641500N;0183100W 1992-07-17	Mini	
Catoptrophorus semipalmatus	FMNH 106365		Female Captive 1950-04	Zeiss 250	Tom Mitchell (2018)*
Catoptrophorus semipalmatus	FMNH 106237		Female Captive 1948-09	Zeiss 250	
Cepphus carbo	USNM 347755	6 mirrored, 2 estimated	O. Austin Asia, Japan, Hokkaido, Hokkaido Prefecture, Teure-Jima 28 Jun 1949	Mini	
Cepphus columba	USNM 612989		C. Wood and G. Shugart Male North America, United States, Washington, Clallam, Pillar Point 25 Jan 1990	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Cepphus columba	LACM 110513		Guthrie, D.A. Exxon-Valdez Oil Spill specimen Female North America, US, Alaska, Prince William Wound, Green Island, Gibbon Anchorage, 60 36 52 N, 147 10 12 W 1989-04-18	Mini	
Cepphus grylle	USNM 623291		P. Windler North Atlantic Ocean, Iceland, Keflavik, Coast North of, 64 02 N, 22 34 W 2001-08-09	Mini	
Cepphus grylle	ROM 126909		Bradstreet, M.S.W. (geoferenced by Bradley G. Millen (ROM)) Male 388g North America; Canada; Nunavut; Qikiqtaaluk Region, Cape Warrender, Devon Island 742700N; 0820300W 1976-08-17	Mini	
Cerorhinca monocerata	USNM 347760	6 mirrored	O. Austin Asia, Japan, Hokkaido, Hokkaido Prefecture 1949-06-25	Mini	
Cerorhinca monocerata	ROM 119522		Geoferenced by Bradley G. Millen (ROM) Female 430g North America; Canada; British Columbia; Skeena-Queen Charlotte Regional District, South Bay, Triangle Island, western most of the Scott Islands, W of Cape Scott at NW end of Vancouver Island 505200N; 1290500W 1973-06-06	Mini	
Charadrius alexandrinus	FMNH 317849		Male North America, USA, Texas, San Patricio Co: Padre Island, 26.8439999, -97.3679962 1967-04-03	Zeiss 75	Mandar Bhagat (2017)
Charadrius alexandrinus	FMNH 376156		Female North America, USA, Florida, Collier Co: Marco Id, 26.160135-81.3607445 1959-05-01	Zeiss 75	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Charadrius asiaticus	FMNH 368847		Female Africa, Kenya, Eastern: Lake Rudolf, Allia Bay 1958-12-01	Zeiss 75	Lironziv (2013)*
Charadrius asiaticus	ROM 156945		Baker, A.J. and Peck, M.K. georeferenced by Bradley G. Millen Female 81g Africa, Namibia, Hardap, near Uhlenhorst (Norikam Farm), -23.692634, 17.9653931 1991-12-11	Mini	
Charadrius bicinctus	ROM 122588		Baker, A.J., georeferenced by Bradley G. Millen Female 68g Oceania; Australia; Tasmania, Ralphs Bay, 425825S;1472545E	Mini	DougNorrisFam (2012)*
Charadrius bicinctus	ROM 0136248		Baker, A.J., georeferenced by Bradley G. Millen Male 55g Oceania; Australia; Tasmania, Greens Beach, 410511S;1464430E 1979-03-22	Mini	
Charadrius collaris	ROM 158366		Peck, M.K. and georeferenced by Bradley G. Millen Male 32g South America, Chile, Valparaiso, Santo Domingo Beaches, 333800S;0713900W 1995-02-24	Mini	Sclateria (2007)*
Charadrius dubius	ROM 158391		Georeferenced by Bradley G. Millen Female 36g Europe, Sweden, Uppsala, Storvreta, 595500N;1703800E 1995-07-04	Mini	KapFar (2013)*
Charadrius falklandicus	ROM 158349	25 mirrored	Peck, M.K., georeferenced by Bradley G. Millen Male 142g South America, Chile, Magallanes y de la Antarctica Chilena, Rio Tres Brazos, 531000S;0705600W 1995-02-13	Mini	Botto et al. (2000)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Charadrius falklandicus	ROM 129581		Baker, A.J., georeferenced by Bradley G. Millen Female 59.9g South America; Argentina; Santa Cruz Province, 85 km W Rio Gallegos, Los Horquetas Estancia, 513500S;0703100W 1977-11-09	Mini	
Charadrius hiaticula	FMNH 368834		Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1958-10-23	Zeiss 75	Birdfun (2017)*
Charadrius hiaticula	FMNH 368835		Female Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1959-01-10		
Charadrius leschaultii	ROM 156970		Baker, A.J. and Peck, M.K., georeferenced by Bradley G. Millen Female 92g Africa; South Africa; Kwazulu-Natal, Durban, Bayhead, 295300S;0310000E 1991-12-18		Pete Hines (2013)*
Charadrius leschenaultii	USNM 621501		Female Asia, Mongolia, Omnogovi, Dalandzadagad 26 May 1997	Mini	
Charadrius marginatus	LACM 90217	68 mirrored, 14 estimated	Schreiber, R.W. Africa, South West Africa, Swakopmund Dist, Swakopmund 5 km N, 22 40 S, 014 34 E 04 Oct 1977	Mini	Engelbrecht (2011)
Charadrius marginatus	FMNH 429392		Female Africa, Central African Republic, Sangha-Mbaere: Parc National de Dzanga-Ndoki, 38.6 km S Lidjombo 2001-05-23	Zeiss 75	
Charadrius (Elseyornis) melanops	ROM 122710	92 estimated	Baker, A.J., georeferenced by Bradley G.Millen Female 32.5g Oceania; Australia; Victoria, Mildura, 341139S;1420921E 1974-08-09	Mini	Mostly Nature (2017)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Charadrius melanops	ROM 122711	4 mirrored	Baker, A.J., georeferenced by Bradley G.Millen Male 28.5g Oceania; Australia; Victoria, Mildura, 341139S;1420921E 1974-08-09	Mini	
Charadrius melodus	ROM 15084		Baker, A.J., georeferenced by Bradley G.Millen South America; Argentina; Chubut Province, Punta Tafor 450300S; 0661600W 1981-11-15	Mini	Stoil Ivanov (2018)*
Charadrius melodus	ROM 150802	4 mirrored	Strauch, J.G. Jr.	Mini	
Charadrius modestus	ROM 158348		Female 69g Chile Magallanes Province	Mini	Deconto (2016)*
Charadrius modestus	ROM 158361		Female 76g Chile, Magallanes Province Dinamarquero 118 km N Punta Arenas by	Mini	
Charadrius montanus	LACM 87090	14 estimated	Willet, G.W. North America, United States, California, Kern, Blackwell's Corner, 35 38 N, 119 48 W 12 Nov 1938	Mini	Woolley (2016)
Charadrius montanus	LACM 117334		Tiller, D. Male North America, United States, California, Imperial Co., Salton Sea National Wildlife Refuge 15 February 1995	Mini	
Charadrius palidus	ROM 156882	3 mirrored, 2 estimated	Baker, A.J. and Peck, M.K., georeferenced by Bradley G. Millen Female 49g Africa; South Africa; Western Cape, Velddrif 324700S; 018100E 1991-11-29	Mini	Peacock et al. (2014)
Charadrius pecuarius	FMNH 368837	16 mirrored	Male Africa, Kenya, Eastern: lake Rudolf, El Molo Bay 1958-11-11	Zeiss 75	Nasirwa (2015)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Charadrius pecuarius	FMNH 368842		Male Africa, Kenya, Eastern: lake Rudolf, El Molo Bay 1958-11-09	Zeiss 75	
Charadrius ruficapillus	ROM 122594		Baker, A.J., georeferenced by Bradley G. Millen Female 38g Oceania; Australia; Tasmania, Ralphs Bay, 425825S;1472545E 1974-07-26	Mini	BIBY TV (2018)*
Charadrius ruficapillus	ROM 122621	16 estimated	Baker, A.J., georeferenced by Bradley G. Millen Male 42g Oceania; Australia; Tasmania, Adventure Bay, Bruny Island, 432137S;1471920E 1974-07-29	Mini	
Charadrius (Oreopholus) ruficollis	ROM 158360		Peck, M.K. georeferenced by Bradley G. Millen Male 146g South America; Chile; Magallanes y de la Antartica Chilena, Hotel Dinamarquero, 118 km N Punta Arenas by road, 523000S;0703200W 1995-02-14	Mini	
Charadrius semipalmatus	FMNH 342530		Male North America, USA, Florida, Collier Co: Marco Id, 26.1601353,-81.3607445 1986-04-12	Zeiss 75	
Charadrius semipalmatus	FMNH 106698	1 mirrored	Female North America, USA, Illinois, Cook Co, Chicago: Lake Calumet 41.6804352, -87.5826492 1954	Zeiss 75	
Charadrius tricollaris	FMNH 368843	46 estimated	Male Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1958-11-09	Zeiss 75	Birding Safaris VF (2018)*
Charadrius tricollaris	FMNH 368844		Female Africa, Kenya, Eastern: Loiyangalani 1959-01-09	Zeiss 75	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Charadrius vociferus	FMNH 390434		Male North America, USA, Wisconsin: northeastern, 45.1123001, -88.527832	Zeiss 75	Yves Limpalair (2016)*
Charadrius vociferus	FMNH 454807		Female Captive 2006-10-15	Zeiss 75	
Charadrius wilsonia	FMNH 360218		North America, USA, Florida, 27.8703803, -82.8549806	Zeiss 75	
Charadrius wilsonia	FMNH 376171	7 mirrored	Male North America, USA, Florida, Collier Co: Marco Id, 26.1601353,-81.3607445 1959-05-01	Zeiss 75	
Chlidonias hybrida	FMNH 338016		Male Europe, France, Bouches-du-Rhone: Les Sautes Mories, Camargue 1957-06-10	Zeiss 75	Romy Ocon (2010)*
Chionis alba	USNM 490217		Female South America, Argentina, Golfo San Matias, SE Shore, 1 mile Off 1969-07-13	Mini	Favero (1996)
Chionis alba	ROM 128919		Baker, A.J. georeferenced by Bradley G. Millen Female 559g South America; Argentina; Chubut Province, Faro Punta Ninfas, 425600S;0642000W 1977-11-13	Mini	
Chlidonias leucopterus	FMNH 368885		Male Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1958-11-06	Zeiss 75	
Chlidonias leucopterus	FMNH 368887	5 mirrored	Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1958-11-06	Zeiss 75	
Chlidonias nigra	ROM 102518		Dick, J.A., georeferenced by Bradley G. Millen Female 59.2 North America, Canada; Saskatchewan; Moosomin Rural Municipality, 1 mi N, 1 mi W Fleming 500400N;1013100W 1968-06-25	Mini	Heath et al. (2020)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Childonias nigra	FMNH 105798		Male North America, USA, Illinois, Cook Co: Matteson 41.506087, -87.732376 1939-05-25	Zeiss 75	
Creagrus frucatus	USNM 18492		South Pacific Ocean, Galapagos Islands, San Cristobal Island	Mini	Cruz et al. (2013)
Creagrus furcatus	LACM 101442	12 estimated	Pitman, R.L. Female 540g South America, Peru, Piura Dept, 05 10 S, 081 36 W 08 Mar 1982	Mini	
Cursorius cursor	USNM 603507		Female Africa, Egypt, Matruh, Burg El Arab 24 Mar 1970	Mini	Palomino et al. (2008)
Cursorius cursor	FMNH 368871		Male Africa, Kenya, Eastern: Loiyangalani, 0.5 mi N 1958-10-30	Zeiss 75	
Cursorius temminickii	ROM 156942	2 mirrored	Baker, A.J., and Peck, M.K., georeferenced by Bradley G. Millen Female 79g Africa; Namibia; Hardap, near Uhlenhorst (Norikam Farm), -23.692634, 17.9653931 1991-12-11	Mini	Wazo3927 (2012)*
Dromas ardeola	USNM 488404	7 mirrored	F. Gill Female Indian Ocean, Seychelles, Amirante Isles 1964-06-15	Mini	Soni and Bhuva (2007)
Eudromias morinellus	USNM 603466	46 mirrored	Male Africa, Egypt, Matruh, Bahig, 10 km S 14 Jan 1971	Mini	Andrew Cooper (2019)*
Fratercula arctica	ROM 144107	2 estimated	Bradstreet, M S W, georeferenced by Bradley G. Millen Male 607.4g North America; Canada; Newfoundland and Labrador, Gannet Island, Labrador 535600N;0563200W 1981-07-03	Mini	Shoji et al. (2015)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Fratercula arctica	ROM 144101	1 mirrored, 2 estimated	Bradstreet, M S W, georeferenced by Bradley G. Millen Female 509.7 North America; Canada; Newfoundland and Labrador, Gannet Island, Labrador 535600N;0563200W 1981-07-03	Mini	
Fratercula cirrhata	ROM 119567		Georeferenced by Bradley G. Millen Male North America; Canada; British Columbia; Skeena-Queen Charlotte Regional District, South Bay, Traingle Island, western most of the Scott Islands, W of Cape Scott at NW end of Vancouver Island 505200N; 1290500W 1972-06	Mini	
Fratercula cirrhata	FMNH 364740		California, San Francisco Farallon Is, Point Reyes Bird Observatory	Zeiss 250	
Fratercula corniculata	LACM 117861	1 mirrored	Male 23 Jun 1979	Mini	
Fratercula corniculata	LACM 117862		Female 1979-06-22	Mini	
Gabianus (Leucophaeus) scoresbii	USNM 345119		South America, Chile, Bio-Bio, Talcahuano	Mini	Suárez and Yorio (2005)
Gabianus scoresbii	LACM 103815		Female 21 April 1986	Mini	
Gallinago gallinago	FMNH 342533		Female North America, USA, Florida, Pinellas Co, 27.8938749, -82.7102586 1985-12-28	Zeiss 250	Hoodless et al. (2007)
Gallinago gallinago	LACM 93280		Schreiber, R.W. Male South America, Argentina, Corrientes Prov, Itati Dept, Itati; 40 km E or, 27 16 S, 058 15 W 21 May 1981	Mini	
Gallinago hardwickii	USNM 612667		Female Australia, Australia, Queensland, Townsville 10 Mar 1987	Mini	Allan Broomhall (2019)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Gallinago hardwickii	ROM 122701		Baker, A.J., georeferenced by Bradley G. Millen Male Oceania; Australia; Victoria, Dandenong, 375917S;1454438E 1974-08-04	Mini	
Gallinago jamesoni	USNM 501641	6 mirrored	A Gardner South America, Ecuador, Chimborazo, Urbina, 1.5 km N 15 Aug 1976	Mini	Cesar-Birders (2019)*
Gallinago media	USNM 431836		R. Leaky Male Africa, Kenya, Rift Valley Province, Lake Kwenia 22 Nov 1961	Mini	Pete Hines (2013)*
Gallinago megala	USNM 621521		Male Asia, Mongolia, Tov, Hentiyn Nuruu, 48 21 45 N, 106 18 15 E 19 June 1997	Mini	Uncle Fai (2019)*
Gallinago megala	FMNH 358243		Female Asia, Philippines, Sibuyan: Agnonok, 3.5 km ENE Magdiwang 1992-03-04		
Gallinago nigripennis	USNM 48442	6 mirrored		Mini	Tim Cockcroft Birding (2016)*
Gallinago nigripennis	ROM 157621	3 mirrored, 2 estimated	Berruti, A., georeferenced by Bradley G. Millen Male 124g Africa; South Africa; Kwazulu-Natal, Newcastle, -27.7500885, 29.942894 1993-03-23	Mini	
Gallinago nobilis	USNM 346755	2 mirrored, 2 estimated	F. Lehmann Female South America, Colombia, Laguna San Rafael, Paramo De Purace 28 Feb 1944	Mini	Bogota Birding and Nature Colombia Tours (2011)*
Gallinago paraguaiae	USNM 622351			Mini	Ciro Albano (2011)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Gallinago paraguaiae	ROM 129620	209 estimated, 1 mirrored	Baker, A.J., georeferenced by Bradley G. Millen Male 114.5g South America; Argentina; Santa Cruz Province, 85 km W Rio Gallegos, Los Horquetas, Estancia, 513500S, 0703100W 1977-11-09	Mini	
Gallinago stenura	USNM 557035		P. Taylor Male Asia, Indonesia, Halmahera, Maluku Kampung Pasir Putih, Jailolo District 1981-10-08	Mini	Alan Dalton (2016)*
Glareola maldivarus	USNM 19580	7 mirrored, 4 estimated	Asia, India	Mini	Piersma and Hassell (2010)
Glareola nordmanni	USNM 430839	3 mirrored	R. Smithers Male Africa, Botswana, Rakops, Quomo Store 20 Jan 1959	Mini	
Glareola nuchalis	USNM 347397		H. Beatty Male Africa, Liberia	Mini	Cumming et al. (2012)
Glareola pratincola	FMNH 105767		Female Captive Febuary 1939	Zeiss 75	Calvo and Furness (1996)
Glareola pratincola	ROM 156964		Baker, A.J and Peck, M.K. Male 99g Africa, South Africa, Kwazulu-Natal near Hluhluwe, -28.0253185 32.2790337 1991-12-16	Mini	
Gygis alba	FMNH 314021		Female Polynesia, Midway Is. Eastern Island 1959-12	Zeiss 250	Niethammer and Patrick (1998)
Gygis alba	FMNH 314022		Female Polynesia, Midway Is. Eastern Island 1959-12	Zeiss 75	
Haematopus ater	ROM 128856		Baker, A.J. Male 749g South America; Argentina; Chubut Province, Punta Clara -43.9746267, -65.2423525 1977-11-12	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Haematopus bachmani	ROM 0146602		Strauch, J.G Jr. Female 683g North America; USA; Alaska; Valdez-Cordova, Orca Inlet, 10 mi SW Cordova, 603123N, 1455200W 1981-05-03	Mini	
Haematopus chathmensis	ROM 116435	6 mirrored	Baker, A.J. Female Oceania; Chatham Islands, New Zealand, 440000S;1763000E 1970-11-17	Mini	Schmechel (2001)
Haematopus finschi	LACM 117276		Collins, C.T. Female Oceania, New Zealand, South Island, South Pacific, Porters pass; rte 73 near L. Lyndon 1990-12-10	Mini	Sagar and Veitch (2014)
Haematopus finschi	ROM 119646		Baker, A.J. Female 600g Oceania, New Zealand, Canterbury, Christchurch, 433148S; 1723824E 1970-06-16	Mini	
Haematopus fuliginosus	ROM 122613		Baker, A.J., georeferenced by Bradley G. Millen (ROM) Female 840g Oceania; Australia; Tasmania, Adventure Bay, Bruny Island 432137S;1471920E 1974-07-29	Mini	BIBY TV (2015)*
Haematopus fuliginosus	ROM 122612		Baker, A.J., georeferenced by Bradley G. Millen (ROM) Male 762g Oceania; Australia; Tasmania, Adventure Bay, Bruny Island, 432137S;1471920E 1974-07-29	Mini	
Haematopus lecucopodus	USNM 490993		J. Angle and D. Bridge Male South America, Argentina, Tierra Del Fuego, Isla De Los Estados, Puerto Basil Hall 20 May 1971	Mini	Gatto et al. (2008)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Haematopus leucopodus	ROM 158356		Peck. M.K. (georeferenced by Bradley G. Millen) Male 600g South America; Chile; Magallanes y de la Antartica Chilena, Rinconanda Bulnes, near Punta Arenas, 531000S, 0705600W 1995-02-13	Mini	
Haematopus longirostris	ROM 0152154		Baker, A.J. and Peck, M.K., georeferenced by Bradley G. Millen Male Oceania, Australia, Victoria, Corinella Peninsula, Western Port Bay, 382452S;1452530E 1985-12-09	Mini	Bear Dale (2018)*
Haematopus longirostris	ROM 136421	14 estimated	Female Australia: Greens Beach, Tasmania, 725g March 25 1979	Mini	
Haematopus moquini	ROM 144605		Baker, A.J., georeferenced by Bradley G. Millen Male 640g Africa; South Africa; Western Cape, Marcus Island, 330200S;0175800E, found dead 1982-01-22	Mini	Ryan and Visagie (2008)
Haematopus moquini	USNM 558480		P. Haarhoff and H. James Male Africa, South Africa, Western Cape Province, Cape Town, 58 km N, Rocky Shore 1983-03-12	Mini	
Haematopus ostralegus	FMNH 363899		Male Europe, The Netherlands, Zeeland: Borssele 1989-12-17	Zeiss 250	Birdfun (2016)*
Haematopus ostralegus	ROM 118045		Boot, J.P.C., georeferenced by Bradley G. Millen Female 465g Europe; Netherlands, Zeeland, Schouwen-Duiveland, 513900N, 0035500E 1972-10-09	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Haematopus palliatus	USNM 623506			Mini	Claire Herzog (2014)*
Haematopus palliatus	ROM 123861		Strauch, J.G. Jr., georeferenced by Derek Spinei (UMMZ) Male 610g North America; USA; South Carolina; Georgetown County, North Island, Sea Island 331724N;0791120W 1975-03-04	Mini	
Haematopus unicolor	ROM 123067	1 mirrored	Baker, A.J. georeferenced by Bradley G. Millen Female 713g Oceania; New Zealand; Auckland, Henderson Bay, 344500S;1737480E 1974-07-19	Mini	
Haematopus unicolor	ROM 146618		Veitch, C.R. georeferenced by Bradley G. Millen Male 723g Oceania; New Zealand; Auckland, South Waikato Head, 372300S;1744300E 1982-04-13	Mini	
Heteroscelus brevipes	ROM 0159634	47 mirrored	Baker, J.A., georeferenced by Bradley G. Millen Female Oceania; Australia; Western Australia, Broome Bird Observatory, Fish Heads Beach, 175800S; 1222000E 1996-02-23	Mini	MrChopsta (2018)*
Heteroscelus incanus	USNM 612203	4 estimated, 46 mirrored	R. Imler Female North America, United States, Alaska, Wrangell-Petersburg, C.A., Kupreanof Island 31 Aug 1946	Mini	Bill Walker (2018)*
Heteroscelus incanus	LACM 87138	4 estimated	Willett, G.W. Male North America, USA, California, Los Angeles County, San Clemente Island, 32 55 00 N, 118 30 W 08 Oct 1933	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Himantopus himantopus	USNM 431803		R. Leakey Male Africa, Kenya, Rift Valley Province, Lake Kwenia 27 April 1962	Mini	MyBackyardBirding (2017)*
Himantopus himantopus	ROM 156898		Baker, A.J. and Peck, M.K., georeferenced by Bradley G. Millen Male 159g Africa; South Africa, Western Cape, Lamberts Bay, 320400S; 0182000E 1991-12-05	Mini	
Himantopus leucocephalus	USNM 226007		H. Raven Female Asia, Indonesia, Celebes, Rano Lindoe 1917-03-16	Mini	The Bird Hide (2015)*
Himantopus leucocephalus	ROM 102237	1 mirrored	Baker, A.J. georeferenced by Bradley G. Millen Female 213g Oceania; New Zealand, Auckland, Sand Island, Kaipara Harbour, 363224S; 1742212E 1986-04-29	Mini	
Himantopus melanurus	LACM 109597	17 estimated	Campbell, K.E. Male South America, Ecuador, Guayas Prov, Santa Elena, 31 Mi N 02 Feb 1970	Mini	Fauna and Flora (2019)*
Himantopus mexicanus	ROM 114769		Johnston, R.R. , georeferenced by Tyler Weaver (PSM) North America; USA; Arizona; Maricopa County, Phoenix, Sewer plant, 332527N;1120639W 1972-03	Mini	Robinson et al. (2020)
Hydrophasianus chirigrus	USNM 226034		R. McGregor Female Asia, Philippines, Luzon, Paete 1917-03-28	Mini	Amar-Singh HSS (2020)*
Ibidorhyncha struthersi	USNM 292767	14 estimated	D. Graham Female Asia, China, Sichuan 1929-02-12	Mini	Through My Lens, (2020)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Irediparra gallinacea	USNM 553360		Female Australia, Papua New Guinea, New Guinea, Central Province, Kerima Village, Brown River 1969-08-27	Mini	Tim Siggs (2015)*
Jacana jacana	LACM 87052	70 mirrored, 6 estimated	Ward, CO South America, Brazil, Orinoco	Mini	
Jacana jacana	FMNH 376133		Female Captive 1969	Zeiss 75	
Jacana spinosa	FMNH 105999		Male Cuba; Matanzas Zapata SW R. Hatiguanico Feb 04 1940	Zeiss 75	
Larosterna inca	FMNH 437527	1 mirrored	Captive 1983	Zeiss 250	
Larosterna inca	LACM 107162	7 mirrored	Jennings, J. Aviary Bird 05 Oct 1987	Mini	
Larus argentatus	LACM 117517		Bennett, R.J. North America, United States, California, Orange County, Seal Beach 1970-04-20	Mini	Weseloh et al. (2020)
Larus argentatus	FMNH 342553		Male North America, USA, Florida, Isla del Sol 27.7067833, -82.7153778 1986-03-01	Zeiss 75	
Larus atricilla	FMNH 376259		Male North America, USA, Florida, Dade Co: Biscayne Bay, Norris Cut 25.7565706, -80.1450491 1953-05-07	Zeiss 75	Burger (2020)
Larus atricilla	LACM 117558		Collins, C.T. North America, US, Florida, Pinellas County, Boca Ciega Bay, found dead in breeding colony 1973-07-09	Mini	
Larus audouinii	USNM 488784	5 mirrored	G. Watson Female Europe, Greece, Dhodhekanisos, Stephania, Taia Nisia 2 Jul 1966	Mini	Ruiz et al. (1996)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus atlanticus	USNM 635816		Female South America, Uruguay, Rocha, mouth of the Arroyo de Chuy, ca 16 km S, 33 48 S, 53, 26 W 2005-10-25	Mini	
Larus bulleri	ROM 116397		Baker, A.J., georeferenced by Bradley G. Millen Female 260g Oceania; New Zealand; Hawke's Bay, Napier, 393000S;1765324E 1972-07-19	Mini	Brown (2001)
Larus bulleri	ROM 153422		Peck, M.K., and Baker, A.J., georeferenced by Bradley G. Millen Female 224g Oceania; New Zealand, Southland, Lochiel 461200S;1681948E 1987-11-22	Mini	
Larus cachinnanas	LACM 120527			Mini	Skórka and Wójcik (2008)
Larus cachinnanas	LACM 120528			Mini	
Larus californicus	FMNH 105796		Female Captive 1939-04	Zeiss 75	Winkler (2020)
Larus californicus	ROM 76529		Shortt, T.M., georeferenced by Bradley G. Millen Female North America; Canada; Saskatchewan; Northern Saskatchewan Administration Distict, Beaver Point, W of Fond-du-Lac, Lake Athabasca, 590800N;1085600W 1945-07-24	Mini	
Larus canus	FMNH 363901		Male Europe, The Netherlands, Zeeland: Oesterdam, Thalen 1987-09-01	Zeiss 75	Garthe and Hüppop (1998)
Larus canus	FMNH 398933		Female North America, USA, Alaska, College Rd at Crossover Way	Zeiss 75	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus cirrocephalus	LACM 109733	14 estimated	Campbell, K.E. Female 384.3g South America, Peru, Piura Dept, Sechura, 23 Mi S 02 April 1970	Mini	
Larus cirrocephalus	ROM 156972		Baker, A.J. and Peck, M.K., georeferenced by Bradley G. Millen Male 320g Africa; South Africa; Kwazulu-Natal, Durban, Bayhead 295300S, 0310000E 1991-12-18	Mini	
Larus crassirostris	USNM 633465			Mini	Suzuki et al. (2019)
Larus delawarensis	FMNH 495258		Male North America, USA, Illinois, Cook Co, Chicago 41.8327351, -87.6654053 2014-06-09	Zeiss 250	Pollet et al. (2020)
Larus delawarensis	LACM 117501		Male North America, US, California, Imperial County, Salton Sea National Wildlife Refuge Nov-December 1975	Mini	
Larus domincanus	USNM 631732		G. Oskarsson Male North Atlantic Ocean, Iceland, Northwest of Keflavik 64 02 N, 22 36 W 2001-08-07	Mini	Bertellotti and Yorio (2000)
Larus dominicanus	LACM 103871		Male Captive Specimen 05 May 1986	Mini	
Larus fulginosus	LACM 87185	26 mirrored, 12 estimated	Willet, G.W. Female North America, US, California, Los Angeles County, San Pedro, 33 45 N, 118 19 00 W 1929-10-19	Mini	
Larus fuscus	USNM 631734		Male North Atlantic Ocean, Iceland,Keflavik, NW of, 64.03 lat, -22.6 long, 64 02 N, 22 36 W 2001-08-07	Mini	Kim and Monaghan (2006)
Larus fuscus	USNM 631736		Female North Atlantic Ocean, Iceland,Keflavik, NW of, 64.03 lat, -22.6 long, 64 02 N, 22 36 W 2001-08-07	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus genei	USNM 500267		Asia, Azerbaijan, Masalli, Kisil-Agach, Zaporednik 20 Mar 1965	Mini	Liordos (2010)
Larus genei	LACM 120525	32 mirrored		Mini	
Larus glaucescens	LACM 100742		FandD Disposal Male 880g North America, US, California, Los Angeles, Santa Monica 34 00 31 N, 118 29 54 W 20 Jan 1983	Mini	Hayward and Verbeek (2020)
Larus glaucescens	USNM 635127		M Klope et al. Female North America, United States, Washington Island Oak Harbor, Whidbey Island Naval Air Station, Seaplane Base 2002-02-26	Mini	
Larus glaucoides	USNM 637972		W. Lynch, hit by truck on runway 29 Female North America, Canada, Newfoundland, St. Johns Airport 2007-02-26	Mini	Snell et al. (2020)
Larus glaucoides	ROM 119866		Macpherson, A.H., georeferenced by Bradley G. Millen Male 1045g North America; Canada; Nunavut; Qikiqtaaluk Region, Cape Dorset, Foxe Peninsula, Baffin 641400N, 0763300W 1955-05-31	Mini	
Larus hartlaubi	USNM 558519		Female Africa, South Africa, Western Cape Province, Cape Town, Strandfontein Sewage Works 1983-05-18	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus hartlaubi	ROM 156844		Baker, A J; Peck, M K, georeferenced by Bradley G. Millen Male 275g Africa; South Africa, Western Cape, Muizenburg, Coastal Park, 340600S; 0182700E 1991-11-27	Mini	
Larus heermani	FMNH 338164	1 mirrored	Male North America, USA, California: southern	Zeiss 75	
Larus heermanni	FMNH 338163		Female North America, USA, California, Southern	Zeiss 250	
Larus hyperboreus	ROM 0091342		Snell, RR, georeferenced by Bradley G. Millen Male 1840g Europe; Svalbard and Jan Mayen, Adventfjorden, Spitzbergen, 781400N;0153900E 1987-06-12	Mini	
Larus hyperboreus	FMNH 105260		Female North America, Greenland, Hudsonland, Muskox Fjord, Ymers Id 1936-08-01	Zeiss 75	
Larus icthyaetus	USNM 502138	6 mirrored	Female Asia, Azerbaijan, Masalli, Kizilagach 11 Mar 1965	Mini	Datta et al. (2016)
Larus livens	LACM 103872		MC Kernan, R.L. Female 1000g North America, United States, California, Imperial County, Salton City 33 18 58 N, 115 58 59 W 05 Sep 1987	Mini	Patten (1996)
Larus livens	LACM 104291	6 mirrored	MC Kernan, R.L North America, United States, California, Imperial County, Salton City 33 18 58 N, 115 58 59 W 05 Sep 1987	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus maculipennis	ROM 129555		Baker, A.J. , georeferenced by Bradley G. Millen Male 321.8g South America; Argentina; Santa Cruz Province, 85 km W Rio Gallegos, Los Horquetas Estancia, 513500S;0703100W 1977-11-07	Mini	Leopold et al. (2010)
Larus maculipennis	ROM 158353		Peck, M.K. Georeferenced by Bradley G. Millen Female 270g South America; Chile; Magallanes y de la Antartica Chilena, near Punta Arenas (Rio Colorado) 531000S;0705600W 1995-02-13	Mini	
Larus marinus	FMNH 338219		Female North America, USA, New Jersey, Ocean Co, Beach Haven 1958-11-30	Zeiss 75	Good (2020)
Larus marinus	ROM 91533		Georeferenced by Bradley G. Millen Male 2401g North America; Canada; Ontario; Niagara RM 430600N; 0790400W 2003-07-26	Mini	
Larus melancephalus	LACM 120526	14 estimated		Mini	Poot (2003)
Larus minutus	ROM 124006		Andrle, R.F. georeferenced by Bradley G. Millen Male 115.3g North America; USA; New York; Erie County, Buffalo, Times Beach, 425311N;0785243W 1974-09-11	Mini	Ewins and Weseloh (2020)
Larus modestus	LACM 110084	14 estimated	Campbell, K.E. Male South America, Peru, Arequipa Dept., Mollendo 1971-09-21	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus modestus	ROM 158372	1 mirrored	Peck, M.K., georeferenced by Bradley G. Millen Female 340g South America; Chile, Valparaiso, Santo Domingo Beaches 333800S;0713900W 1995-02-24	Mini	
Larus novaehollandiae	FMNH 390848		Australasia, New Zealand, South Id: Kaikoura Peninsula 1990-12-16	Zeiss 75	Auman et al. (2011)
Larus novaehollandiae	ROM 0140609		Baker, A.J., georeferenced by Bradley G. Millen Male 380g Oceania, Australia; Western Australia, Penguin Island 321824S;1154121E 1990-11-24	Mini	
Larus occidentalis	FMNH 105459		Female Captive 1937-10	Zeiss 250	Pierotti and Annett (2001)
Larus occidentalis	LACM 101099	2 mirrored	DandD Disposal Male 1005g North America, US, California, Los Angeles 34 00 31 N, 118 29 54 W 16 December 1982	Mini	
Larus pacificus	ROM 136309	8 estimated	Baker, A.J. georeferenced by Bradley G. Millen Female 1300g Oceania; Australia; Tasmania, Greens Beach, -41.083052, 146.743408 1979-03-23	Mini	Leitch et al. (2014)
Larus pacificus	FMNH 338158	58 mirrored	Australasia, Australia, Victoria: Fort Melbourne 1961-05-11	Zeiss 75	
Larus philadelphia	FMNH 376261		North America, USA, Florida, Dade Co: Miami city limits, N, 25.8406854, -80.2098083 1961-01-12	Zeiss 75	Burger and Gochfeld (2020a)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus philadelphia	ROM 137169		Dick. J.A., georeferenced by Bradley G. Millen Male 208.3g North America; Canada; Ontario; Kenora District, Aquatuk Lake, extreme N end, S of Beaver dam (U), 541700N;0833100W 1980-06-11	Mini	
Larus pipixcan	FMNH 470337		Female North America, USA, North Dakota, McHenry Co: J Clark Salyer National Wildlife Refuge, 48.6149806, -100.6989669 1982-07-21	Zeiss 75	Burger and Gochfeld (2020b)
Larus pipixcan	USNM 622198		Male B. Barber North America, United States, Kansas, Jefferson, Perry Lake Dam, 1.5 mi S 39 06 – N, 095 25 – W 1999-10-10	Mini	
Larus ridibundus	LACM 120522	7 mirrored		Mini	
Larus ridibundus	LACM 120523			Mini	
Larus schistagus	USNM 500777	1 mirrored	H. Morioka Male Asia, Japan, Hokkaido, Hokkaido Prefecture, Notsuke Peninsula, Shibetsu, Near, Nemuro District 7 Sep 1976	Mini	Zelenskaya (2014)
Larus serranus	USNM 645298		Female South America, Argentina, Tucuman Province, Tafi del Valle, 5 km S, Embalse la Angostura, 26 54S, 65 42W 1996-11-25	Mini	
Larus serranus	LACM 110060	14 estimated	Campbell, K.E. Male South America, Peru, Puno Dept, L Titicaca 1971-09-13	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Larus thayeri	USNM 347252		Duvall and Handley Female North America, Canada, Northwest Territories, Resolute Bay, Cornwallis Island 1947-09-12	Mini	
Larus thayeri	ROM 119860		Macpherson, A H, georeferenced by Bradley G. Millen Female 850g North America; Canada; Nunavut; Kitikmeot Region, near Pelly Bay, Simpson Peninsula, Camp Colonies 85300N; 0900500W 1956-06-21	Mini	
Lymnocryptes minimus	LACM 89975	47 mirrored, 68 estimated	Marinkelle, C.J. Male Europe, The Netherlands, Friesland Prov, Dokkum, 53 20 N, 005 59E 12 April 1955	Mini	Michael Linklater (2016)*
Limnodromus griseus	LACM 109401		Garrett, K.L. Male 85g North America, US, California, Los Angeles, Lancaster, 10 Km NNE, Pitue Ponds 34.6980419, -118.1367378 11 Sep 1996	Mini	Jehl Jr. et al. (2020)
Limnodromus scolopaceus	USNM 630671			Mini	Mrnolmts (2014)*
Limnodromus scolopaceus	LACM 117431		USFWS Male North America, US, California, Imperial Co, Salton Sea, Natl Wildlife Refuge 06 Jan 1974	Mini	
Limosa fedoa	FMNH 23510		North America, USA, Florida, 27.8703803, -82.8549806	Zeiss 250	Sask Birder (2013)*
Limosa fedoa	USNM 557584	1 estimated	Female North America, United States, California, Humboldt, Spencer Creek, N End 22 Aug 1982	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Limosa haemastica	USNM 489609		R. Zusi and Bindford and Mumford Female North America, Canada, Manitoba, Fort Churchill, 1 mi E 1967-07-19	Mini	Rogeruzun (2019)*
Limosa haemastica	ROM 79406		Exchanged to National Museum of Rhodesia Male 133.4g North America; Canada; Ontario; Halton RM, Royal Botanical Gardens, from Fishway (near mouth of Grindstone Creek?) 431723N;0795312W	Mini	
Limosa lapponica	LACM 87092	1 estimated	Brower, C.D. North America, United States, Alaska 71 17 24 N, 156 47 32 W 20 June 1934	Mini	Birdfun (2016)*
Limosa lappponica	USNM 555156	2 mirrored	W. Van Den Hoven Female Europe, Netherlands, Zuid-Holland, Oostvoorne 26 April 1979	Mini	
Limosa limosa	USNM 320129	7 mirrored	Male 1932-04-10	Mini	John L UK (2019)*
Limosa limosa	ROM 157287		Peck, M.K. and Baker, A.J., georeferenced by Bradley G. Millen Male 220g Europe, Iceland, Vodmulastadir, 633200N; 0210500W 1992-07-18	Mini	
Metopidius indicus	USNM 343995	5 mirrored	H. Deignan Male Asia, Thailand, Chiang Mai 1936-12-14	Mini	Mitesh Patel (2020)*
Microparra capensis	ROM 117587	1 mirrored	Archer, A.L., georeferenced by Bradley G. Millen 29g Africa, Botswana, North-West, Namasseri, 183800S;0220900E 1971-09-06	Mini	AviFauna Naturresor (2016)*
Numenius americanus	FMNH 106289	3 mirrored	Female Captive 1949-07	Zeiss 250	American Bird Conservancy (2016)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Numenius armericanus	ROM 146877	1 mirrored	Strauch, J.G., Jr. , georeferenced by Bradley G. Millen Female North America; USA; Nebraska; Garden County, 10 mi N Crescent Lake National Wildlife Refuge, 414337N;0964807W 1980-04-26	Mini	
Numenius arquata	USNM 553828		W. Van Den Hoven Male Europe, Netherlands, Friesland, Ameland, West Frisian Islands 2 Oct 1978	Mini	Adrian Gopal (2015)*
Numenius arquata	FMNH 363888		Female Europe, The Netherlands, Zuid-Holland: Krammerse Slikken	Zeiss 250	
Numenius madagascariensis	USNM 500255		Male Asia, Russia, Khabarovskiy Kray, River Inn, Country Aur May 2 1975	Mini	Adrian Walsh (2014)*
Numenius madagascariensis	ROM 127514	4 mirrored, 5 estimated	Baker, A.J., georeferenced by Bradley G. Millen Male 523g Oceania; New Zealand; Auckland, Ninety Mile Beach, 343448S;1724724E 1976-12-16	Mini	
Numenius minutus	USNM 347648		H. Deignan Female Australia, Australia, Northern Territory, Oenpelli 28 Oct 1948	Mini	Sjaak Schilperoort (2019)
Numenius phaeopus	FMNH 385840		North America, USA, Florida, Monroe Co: Windley Key, 24.9452004, -80.5962825 1995-09-14	Zeiss 250	Michael Linklater (2017)*
Numenius phaeopus	USNM 638835			Mini	
Numenius tahitensis	USNM 289233		Wetmore, A. Male North Pacific Ocean, Northwestern Hawaiian Islands, Laysan Island, Honolulu County 30 April 1923	Mini	Shoko TANOI (2018)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Numenius tahitensis	LACM 103118	14 estimated	Garrett, K.L. Female 465g Oceania, Marshall Islands, Bikini Atoll, Bikini Islet, 11 35 N, 165 20 E 25 May 1986	Mini	
Rostratula semicollaris	USNM 612032		H. Alvarenga Female South America, Brazil, Rio De Janeiro, Marica 1987-07-30	Mini	Pablo Eguia (2016)*
Oreopholus (Charadrius) ruficollis	FMNH 104122		South America, Chile, Magallanes: Rio Ciaike 1940-01-27	Zeiss 75	Mario Figueroa, (2018)*
Pagophilia eburnea	ROM 127323		Stepney, P.H.R., georeferenced by Bradley G. Millen Female North America; Canada; Nunavut; Qikiqtaaluk Region, Allen Bay, Cornwallis Island 744700N;0951800W 1976-09-07	Mini	Mallory et al. (2020)
Pagophilia eburnea	ROM 147098		Bradstreet, M.S.W., georeferenced by Bradley G. Millen Male North America; Canada; Nunavut; Qikiqtaaluk Region, Poind Inlet, Baffin Island 724800N; 0770600W 1979-06-15	Mini	
Peltohyas australis	USNM 553593	2 mirrored	C. Austin Australia, Australia, South Australia, Woomera, 10 mi W 17 May 1967	Mini	A0S3141 (2010)*
Phaetusa simplex	USNM 345828		Daveron, A. Female South America, Brazil, Mato Grosso, Betweeen Barra Do Bugres, Concepcion, Rio Paraguay 1940-10-04	Mini	
Phaetusa simplex	FMNH 105560	2 estimated	South America, Guyana, E Demerara-W Coast Berbice: Buxton 1937-05-26	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Phalaropus fulicarius	LACM 100444	47 mirrored, 1 estimated	Garrett, K.L. Male, emaciated, found dead 28.5g North America, US, California, Los Angeles County, Malibu Lagoon, 34 02 00 N, 118 39 W 11 Nov 1982	Mini	Scott Carpenter (2011)*
Phalaropus fulicarius	LACM 113112	30 mirrored, 29 estimated	Guthrie, D.A. North America, US, California, Ventura, Pt. Mugu, 34 07 12 N, 119 04 58 W Jan 1975	Mini	
Phalaropus lobatus	FMNH 317852		North America, USA, Alaska: Kaolak River 1951-07-15	Zeiss 75	Birds of Thane and Raigad District (2018)*
Phalaropus lobatus	FMNH 106365		Female Captive 1950-04	Zeiss 75	
Philomachus pugnax	FMNH 104299	2 mirrored	Male Captive 1942-02	Zeiss 75	Julian Bell (2017)*
Philomachus pugnax	FMNH 104265	2 mirrored	Male Captive 1941-10-01	Zeiss 75	
Pluvialis apricaria	ROM 158379		Georeferenced by Bradley G. Millen Female 177g Europe; Finland; Utsjoki, 7 km NE Karigasniemi, 692400N;0255000E 1995-06-26	Mini	Whittingham et al. (2000)
Pluvialis dominica	FMNH 105252	25 mirrored	Male North America, USA, Illinois, Cook Co, Chicago: Lake Calumet 41.6804352, -87.5826492 1936-09-16	Zeiss 75	Chrisopher Boswell (2017)*
Pluvialis dominica	ROM 155330	95 estimated	Peck, M.K., georeferenced by Bradley G. Millen Male North America; Canada; Nunavut, Qikiqtaaluk Region, Pond Inlet, Baffin Island 724800N;0770600W 1989-07-17	Mini	
Pluvialis fulva	USNM 632112	46 mirrored	United States Fish and Wildlife Service Female North Pacific Ocean, Johnston Atoll, Johnston Island 2001-10-15	Mini	Bruce Carlson (2013)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Pluvialis squatarola	FMNH 376148		Male North America, USA, North Carolina, Carteret Co: Portsmouth 35.0648491, -76.0607529 1917-11-05	Zeiss 75	Michael Linklater (2016)*
Pluvialis squatarola	LACM 87074		North America, US, California, Los Angeles County, Marina Del Ray , 33 58 00N, 118 26 00W 00 Dec 1923	Mini	
Pluvianus aegyptius	FMNH 379122		Male 1968-10-24	Zeiss 75	Bert Haamberg (2017)*
Pluvianus aegyptius	FMNH 378793		Male 1968-10-24	Zeiss 75	
Procelsterna albivitta	ROM 123070		Baker, A.J. , Georeferenced by Bradley G. Millen Oceania; New Zealand; Auckland, Great Exhibition Bay 343112S; 1731480E 1974-07-18	Mini	
Procelsterna cerulea	USNM 498057		Pacific Project and P. Woodward Male South Pacific Ocean, Phoenix Islands, Mckean Atoll, Phoenix Islands, Mckean Island 21 Oct 1964	Mini	
Procelsterna cerulea	USNM 614226	4 mirrored	L. Spear Male South Pacific Ocean, Station # 12, 05—-S, 140—-W 9 May 1991	Mini	
Ptychoramphus aleuticus	FMNH 364729		Male North America, USA, California, San Francisco Co: Farallon Is	Zeiss 75	
Ptychoramphus aleuticus	LACM 117815		Warter, S.L. Male North America, US, California, Los Angeles County, San Pedro Channel , halfway to santa barabara from Long Beach 1968-11-22	Mini	
Recurivrostra americana	FMNH 364175		Female North America, USA, Utah 39.5014154, - 111.5475081 1986-08-31	Zeiss 75	My Backyard Birding (2017)*
Recurvirostra americana	FMNH 364177		Female North America, USA, Utah 39.5014154, -111.547081 1986-08-26	Zeiss 250	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Recurvirostra andina	ROM 159573		Gonzalez, J. Sr., and Sallaberry, M. georeferenced by Bradley G. Millen Female 370g South America; Chile; Arica and Parinacota, Lagunas de Cotacotani, 181300S;0693500W 1995-07-26	Mini	ArGilst (2013)*
Recurvirostra avosetta	FMNH 338433		Asia, Israel: Hulla Valley	Zeiss 250	Eastern Cape Birding, (2014)*
Recurvirostra avosetta	USNM 429088		C. Handley Africa, Namibia, Gaucha 1952-10-31	Mini	
Rhinoptilus africanus	USNM 431520	1 mirrored	R. Smithers Male Africa, Botswana, Sekhuma Pan 1961-02-18	Mini	
Rhinoptilus africanus	LACM 117298		National Museum Bloemfontein Female Africa, South Africa, Free State, Bloemfontein, Meriba 24 Sep 1987	Mini	
Rhinoptilus chalcopterus	USNM 321515		Shedley Africa, Tanzania, Zanzibar Island 1863	Mini	Shellie Brown (2011)*
Rhinoptilus chalcopterus	ROM 114357	14 estimated	Dick, J.A., georeferenced by Bradley G. Millen Male 156g Africa; Zimbabwe, Matabeleland North, Humani Ranch, Sabi River 203100S; 0321600E 1972-05-29	Mini	
Rhinoptilus cinctus	ROM 114395		Dick, J.A., georeferenced by Bradley G. Millen Male 143.3 Africa, Zimbabwe, Matabeleland North, Humani Ranch, Sabi River 203100S; 0321600E 1972-05-30	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Rhinoptilus cinctus	ROM 114393	47 mirrored	Dick, J.A, georeferenced by Bradley G. Millen Female 131.8g Africa, Zimbabwe, Matabeleland North, Humani Ranch, Sabi River 203100S;0321600E 1972-05-30	Mini	
Rhodostethia rosea	USNM 491608		G. Watson and G. Divoky Female Arctic Ocean, Chukchi Sea, near Alaska, 7100—N, 15909—W 1970-09-24	Mini	Burger et al. (2020)
Rhodostethia rosea	USNM 491609		G. Watson and G. Divoky Male Arctic Ocean, Chukchi Sea, near Alaska, 7023—N, 16224—W 1970-10-02	Mini	
Rissa brevirostris	USNM 643045			Mini	Kokubun et al. (2015)
Rissa brevirostris	ROM 150523		Troy, D.M., Georeferenced by Christine Coltellaro (UWBM) Male 407.4g North America, USA, Alaska, Aleutians West St George Island, Pribilof Islands, 572400N;1693803W 1984-07-28	Mini	
Rissa tridactyla	FMNH 105263		Male North America, Greenland, Liverpool Land, Rathbone's Id. 1936-08-06	Zeiss 75	Hatch et al. (2020b)
Rissa tridactyla	ROM 150453		Troy, D.M., Georeferenced by Christine Coltellaro (UWBM) 453g North America, USA, Alaska, Aleutians West St George Island, Pribilof Islands, 572400N;1693803W 1984-07-30	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Rostratula benghalensis	FMNH 393178		Female Africa, Madagascar, Toamosina: Station Forestiere de Tampolo 1997-04-03	Zeiss 250	SunDestinations (2016)*
Rostratula benghalensis	USNM 613014		C. Ross et al Female Asia, Philippines, Luzon, Cagayan, Lasam Centro 26 April 1989	Mini	
Rynchops flavirostris	FMNH 368889		Female Africa, Kenya, Rift Valley; Lake Naivasha 1959-01-25	Zeiss 75	Nicholas Acheson (2014)*
Rynchops flavirostris	FMNH 313056		Female Africa, Gabon 1952	Zeiss 75	
Rynchops niger	FMNH 398882		Male North America, USA, Florida, Hillsborough Co; Tampa 27.9773979, -82.4564133 1984-03-18	Zeiss 250	Duncantakeru (2011)*
Rynchops niger	ROM 153490		Peck, M.K. and Baker, A.J., georeferenced by Wyatt Lundy (UMMZ) Female 231g North America, USA, Florida; Collier County, Marco Island 255627N;0814307W 1988-03-11	Mini	
Scolopax minor	FMNH 438027		Female North America, USA, Illinois, Cook Co, Chicago: McCormick Place 41.8528118, -87.611721 2003-04-15	Zeiss 250	Fyn Kynd (2014)*
Scolopax minor	LACM 113134		Guthrie, D.A. North America, United States, Monroe, Hamlin Martin Rd May 1982	Mini	
Scolopax rochussenii	USNM 558308		Y. Momou and R. Tatu Female Asia; Indonesia, Obi Islands, Maluku Galala, Obi Island 2 Sep 1982	Mini	
Scolopax rusticola	USNM 292760		D. Graham Female Asia, China, Sichuan, Yachow 16 Feb 1929	Mini	Israel Wildlife Channel (2016)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Scolopax rusticola	LACM 120516	5 estimated		Mini	
Steganopus tricolor	FMNH 106235		Female Captive 1948-08	Zeiss 75	Stoil Ivanov (2010)*
Steganopus tricolor	FMNH 106234		Female Captive 1948-08	Zeiss 75	
Stercorarius longicaudus	FMNH 105259		Female North America, Greenland, Hudsonland, Muskox Fjord: Ymers Id 1936-08-03	Zeiss 75	Wiley and Lee (2020)
Stercorarius longicaudus	FMNH 105258	3 mirrored	Female North America, Greenland, Hudsonland, Muskox Fjord 1936-07-31	Zeiss 75	
Stercorarius parasiticus	LACM 87186		Willett, G.W. Male North America, United States, California, Los Angeles Co., San Pedro vic, offshore, 33 45 N, 118 19 00 W 01 Oct 1931	Mini	
Stercorarius parasiticus	LACM 117483		Female 375.3g North America, United States, Alaska, Point Barrow 1976-09-27	Mini	
Stercorarius pomarinus	LACM 117477		Kemp, M.H. Male Dead on Pacific Coast Hwy,North America, United States, California, Orange County, Bolsa Chica State Beach 27 Jan 1972	Mini	
Stercorarius pomarinus	FMNH 360238		Female North America, USA, Florida, 27.8703803, -82.8549806	Zeiss 75	
Sterna albifrons	FMNH 443603		Female North America, USA, Alabama, Baldwin Co: Spoil Id, NW of Perdido Key 1995-07-05	Zeiss 75	Catry et al. (2006)
Sterna aleutica	USNM 561252		Lgl Alaska Research Associates Female North America, United States, Alaska, Aleutians East Division, Port Moller Area, Bering Sea 24 May 1985	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Sterna anaethetus	FMNH 360250		North America, USA, Florida, Pinellas Co; Indian Shores 27.8646131, 82.8259983 1985-09-02	Zeiss 75	
Sterna anaethetus	ROM 118653		Barlow, J.C., georeferenced by Bradley G. Millen Male 136g Caribbean; Guadeloupe, Tete a l'Anglais Rock 162300N; 0614600W 1973-05-31	Mini	
Sterna antillarum	FMNH 376281	1 mirrored	Male North America, USA, Florida, Collier Co: Marco Id 26.1601353, -81.3607445 1959-04-10	Zeiss 75	Thompson et al. (2020)
Sterna antillarum	LACM 117649	6 mirrored	Collins, C.T. Female North America, US, California, San Diego Co, South San Diego Bay, Salt Works 31 May 1980	Mini	
Sterna bengalensis	USNM 488347		F. Gill Female Asia, Indonesia, Sumatra, Batu Islands, Bai Island, 00 01 – S, 098 31 –E 1936-11-26	Mini	
Sterna bergii	USNM 558526		Male Africa, South Africa, Cape Province, Vondeling Island 8 April 1983	Mini	Gaglio et al. (2018)
Sterna bergii	USNM 559819		F. Sheldon and J. Kennard Female Asia, Malaysia, Borneo, Sabah, Gaya Bay, South China Sea 06 05 N, 116 05 E 18 May 1983	Mini	
Sterna caspia	FMNH 368884		Male Africa, Kenya, Eastern: Lake Rudolf, Allia Bay 1958-12-05	Zeiss 250	Cuthbert and Wires (2020)
Sterna caspia	FMNH 360641		Female North America, USA, Minnesota, 46.4438614, -93.3633655 1992-08-25	Zeiss 250	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Sterna dougalii	LACM 92016	14 estimated	Given, P for D. E Riska Female North America, US¡ Florida, Monroe Co. Dry Tortugas, Garden Key, Main Dock, 24 38 37 N, 082, 52 37 W 1979-06-26	Mini	Gochfeld and Burger (2020)
Sterna dougallii	FMNH 360247		Male North America, USA, Florida, Monroe Co: Boca Chica, islet W, 24.6669864,-81.2713623 1987-07-17	Zeiss 75	
Sterna elegans	USNM 612541	6 mirrored	C. Collins and Schew North America, United States, California, San Diego, San Diego Bay, South, Salt Works 8 Jun 1987	Mini	
Sterna elegans	LACM 110168		Garrett, K.L. North America, US, California, Orange Co., Bolsa Chica Reserve, 33 41 54 N, 118 02 36 W 05 Jul 1997	Mini	Burness et al. (2020)
Sterna forsteri	LACM 117642		LB Dog and Cat Hospital Female North America, US, California, Southern California 1994	Mini	
Sterna fuscata	FMNH 364607	1 mirrored	North America; USA; Florida; Monroe Co: Dry Tortugas 24.6436291, -82.877037 1993-07-28	Zeiss 75	Erwin and Congdon (2007)
Sterna fuscata	FMNH 376277		Male North America, USA, Florida, Monroe Co, Indian Key, US Hwy 1 24.8827494, -80.6890866 1958-05-24	Zeiss 75	
Sterna hirundinacea	ROM 129623	14 estimated	Baker, A.J., georeferenced by Bradley G. Millen Male 163g South America; Argentina; Chubut Province, Faro Punta Ninfas, 425600S;0642000W 1977-11-14	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Sterna hirundinaceae	LACM 117621		South America, Argentine, Tierra Del Fuego, Argentina, Rio Grande, 10 Mi N 13 Feb 1977	Mini	
Sterna hirundo	FMNH 432821		Male North America, USA, Wisconsin, Calumet Co: Chilton 44.0288649, -88.1584167 2000-10-15	Zeiss 75	Arnold et al. (2020)
Sterna hirundo	LACM 117627		Collins, C.T. North America, United States, New York, Suffolk Co, Great Gull Is.and 1968-06-24	Mini	
Sterna lunata	FMNH 338042		Male Polynesia, Midway Island; Eastern Id	Zeiss 75	Mostello et al. (2000)
Sterna lunata	LACM 104037		Spear, L. Male South Pacific, South Pacific Ocean, 02 30 S, 150 00 W 1987-06-12	Mini	
Sterna maxima	FMNH 376285		Female North America, USA, Florida, Broward Co: Dania Beach 26.0462959, -80.1394272 1975-02-11	Zeiss 75	Buckley and Buckley (2020)
Sterna maxima	FMNH 379033	22 mirrored	Female North America, USA, Florida, St. Lucie Co, Fort Pierce 27.4464685, -80.3263082 1976-09-09	Zeiss 250	
Sterna nilotica	FMNH 368882	6 mirrored	Male Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1959-01-10	Zeiss 75	Molina et al. (2020)
Sterna nilotica	FMNH 368883	6 mirrored	Male Africa, Kenya, Eastern: Lake Rudolf, El Molo Bay 1958-11-10	Zeiss 75	
Sterna paradisaea	FMNH 317854	23 mirrored	Male North America, USA, Alaska: Point Barrow, 7.5 mi S, 7 mi W, 71 (latitude) -158.8166667 1952-09-06	Zeiss 75	Hatch et al. (2020a)
Sterna paradisaea	LACM 100318	1 mirrored	Pitman, R.L. Male 110g North Pacific, North Pacific Ocean, 00 02 N, 110 21 W 16 April 1982	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Sterna repressa	USNM 555610	1 mirrored	J. Ash Africa, Somalia Gezira, 15 km SW, Mogadishu 22 Dec 1979	Mini	
Sterna sandvicensis	FMNH 313439		Male North America, USA, North Carolina, Dare Co: Hatteras Inlet, 35.1906446, -75.7603454 1982-07-31	Zeiss 250	Shealer et al. (2020)
Thalasseus (Sterna) sandvichensis	LACM 117725		Woolfenden, G.E. Female North America, Unites States, Florida, Pinellas Co., Redington Shores 06 Feb 1982	Mini	
Sterna striata	USNM 15428		Australia, New Zealand 1882	Mini	Mrlems1 (2013)*
Sterna striata	ROM 125713		Bell, B.D. georeferenced by Bradley G. Millen Oceania; Chatham Islands; New Zealand, Mangere Island, Chatham Islands, 365800S;1744700E 1975-02	Mini	
Sterna sumatrana	FMNH 104716		Female Australasia, Micronesia, Marshall Is, Rongerik 1946-07-19	Zeiss 75	
Sterna sumatrana	FMNH 346071		Male Australasia, Micronesia, Marshall Is, Enewetak Atoll: Lidilbut 1988-07-25	Zeiss 75	
Sterna supercilliaris	USNM 345825		Daveron, A. Female South America, Brazil, Mato Grosso, Betweeen Barra Do Bugres, Concepcion, Rio Paraguay 7 Oct 1940	Mini	
Sterna supercilliaris	USNM 345826		Daveron, A Male South America, Brazil, Mato Grosso, Betweeen Barra Do Bugres, Concepcion, Rio Paraguay 7 Oct 1940	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Sterna trudeaui	USNM 614631		J. Angle and L. Chiappe Female South America, Argentina, Buenos Aires, Laguna Del Monte,, Eastern End 23 Feb 1992	Mini	García and Mariano-Jelicich (2005)
Sterna trudeaui	ROM 159579		Gonzalez, J., Sr. and Sallaberry, M. , georeferenced by Bradley G. Millen Male 165g South America; Chile; Valparaiso, Santo Domingo beaches, 333800S;0713900W 1995-08-09	Mini	
Sterna vittata	ROM 129621	14 estimated	Baker, A.J., georeferenced by Bradley G. Millen South America; Argentina; Chubut Province, Faro Punta Ninfas 425600S; 0642000W 1977-11-13	Mini	
Stiltia isabella	ROM 149448		Bavid, R.F., georeferenced by Bradley G. Millen Male 85.5g Oceania; Australia; South Australia, Skeleton Bore, Frome Downs 295500S; 1395500E 1982-09-17	Mini	
Synthlboramphus craveri	LACM 87297	3 mirrored	Garth, J.S. Male North America, Mexico, Baja California, Partida Island, Offshore, 28 53 01 N, 113 02 02 W 09 Mar 1936	Mini	
Synthliboramphus craveri	LACM 87296	7 mirrored	Willett, G.W. Female North America, US, California, Los Angeles, San Pedro Vic, Offshore, 33 45 N, 118 19 00 W 1932-08-20	Mini	
Synthliboramphus antiquus	FMNH 364725		North America ,USA	Zeiss 75	
Synthliboramphus antiquus	USNM 561925		Female North Pacific Ocean, 5358—N, 17243–E 1983-07-17	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Synthliboramphus hypoleucos	USNM 291879	7 mirrored	L. Huey Male North America, Mexico, Baja California Norte, Coronados Islands 1928-05-30	Mini	Hamilton et al. (2005)
Synthliboramphus hypoleucus	LACM 87299	28 mirrored	Willett, G.W. Female North America, US. California, Los Angeles County, San Pedro Vic, Offshore, 33 45 N, 118 19 00 W 1932-09-06	Mini	
Thinocorus orbignyianus	USNM 637907		Willett, G.W. Female North America, US, California, Los Angeles County, San Pedro Vic, Offshore, 33 45 N, 118 19 00 W 1932-09-06	Mini	Pantanal BirdClub, (2013)*
Thinocorus orbignyianus	USNM 645613		Female South America, Argentina, Tucuman Province, Tafi del Valle, 14 km N, 6 km W 22 44 S, 65 46 W, bunch grass steppe 1996-12-02	Mini	
Thinocorus rumicivorous	ROM 128899		Baker, A.J., georeferenced by Bradley G. Millen Male 68g South America; Argentina; Santa Cruz Province, 85 km W Rio Gallegos, Los Horquetas Estancia, 513500S;0703100W 1977-11-05	Mini	
Thinocorus rumicivorous	ROM 128902		Baker, A.J., georeferenced by Bradley G. Millen Female 74.8g South America; Argentina; Santa Cruz Province, 85 km W Rio Gallegos, Los Horquetas Estancia, 513500S;0703100W 1977-11-04	Mini	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Thinornis rubricollis	ROM 122636		Baker, A.J., georeferenced by Bradley G. Millen Male 88g Oceania; Australia; Tasmania, Adventure Bay, Bruny Island, 432137S;1471920E 1974-07-30	Mini	Werrong Lane, (2019)*
Thinornis rubricollis	ROM 122635		Baker, A.J., georeferenced by Bradley G. Millen Female 97g Oceania; Australia; Tasmania, Adventure Bay, Bruny Island, 432137S;1471920E 1974-07-30	Mini	
Tringa flavipes	FMNH 290820		North America, USA, Illinois, Cook Co, Chicago, Lake Calumet 41. 6804352, -87.5826492 1980-08-06	Zeiss 75	MyBackyardBirding (2017)*
Tringa flavipes	FMNH 376180	1 mirrored	Male North America, USA, Florida, Collier Co: Ochopee, 2.3 mi W, US Hwy 41, 25.9009762, -81.3374395 1956-04-20	Zeiss 75	
Tringa glareola	FMNH 368854		Male Africa, Kenya; Eastern; Loiyangalani 1959-01-09	Zeiss 75	Michael Linklater, (2018)*
Tringa glareola	FMNH 368852	23 mirrored, 2 estimated	Female Africa, Kenya, Eastern: Lake Rudolf; El Molo Bay 1958-10-16	Zeiss 75	
Tringa melanoleuca	FMNH 464505		Male North America, USA, Wisconsin, 44.8986169, -89.5674821 2007-07-13	Zeiss 75	JustNature (2018)*
Tringa melanoleuca	FMNH 379041		Male North America, USA, Florida, Monroe Co: Plantation Key 24.9741077, -80.5548859 1976-04-28	Zeiss 75	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Tringa nebularia	USNM 620113		Cederholm, I., and Ericson, P. Male Europe, Sweden, Norrbotten, Lapland, Paksuniemi, 12 Km NE of 1994-07-03	Mini	Michael Linklater (2017)*
Tringa nebularia	ROM 156936		Baker, A.J. and Peck, M.K. , georeferenced by Bradley G. Millen Female 180g Africa; Namibia, Erongo, Walvis Bay 225900S;0143100E 1991-12-09	Mini	
Tringa ochropus	USNM 343515	70 mirrored	H. Deignan Female Asia, Thailand, Chiang Mai 21 Mar 1936	Mini	Michael Linklater (2018)*
Tringa ochropus	FMNH 368850		Male Africa; Kenya; Eastern: Loiyangalani 1958-10-28	Zeiss 75	
Tringa solitaria	FMNH 395650		North America, USA, Wisconsin, Door Co; Longtail Id 44.6022017, -87.9893303	Zeiss 75	Babyleon (2013)*
Tringa solitaria	FMNH 363458	1 mirrored, 1 estimated	Female North America, USA, Wisconsin, Brown Co 44.4671112, -88.0032349 1993-08-13	Zeiss 75	
Tringa stagnatilis	ROM 156883	48 mirrored	Baker, A.J. and Peck, M.K., georeferenced by Bradley G. Millen Male 95g Africa; South Africa; Western Cape, Velddrif 324700S; 0181000E 1991-11-29	Mini	Mark Andrews (2013)*
Tringa stagnatilis	FMNH 106354	5 mirrored, 2 estimated	Captive Female 1950-01	Zeiss 75	
Tringa totanus	USNM 623276		G. Oskarsson Male North Atlantic Ocean, Iceland, US Naval Base at Keflavik Naval Air Station, Iceland 63 56 11.0 N, 22 40 39.9W 2001-08-08	Mini	Michael Linklater (2018)*

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Tringa totanus	ROM 157255	46 mirrored	Peck, M.K. and Baker, A.J. Male 140g Europe; Iceland; Stokkseyri, 635000N; 0213500W 1992-07-15	Mini	
Tryngites subruficollis	ROM 151467	95 estimated	Strauch, J. G., Jr., georeferenced by Bradley G. Millen Male 104g North America; USA; Nebraska; York County, 4 mi NW York, 405225N;0973548W 1985-05-14	Mini	WWT (2011)*
Tryngites subruficollis	ROM 122461	95 estimated	Rising, J.D., georeferenced by Yumiko Uchiro (UAM) Female 67.5g North America; USA; Alaska: North Slope, Cape Simpson 705921N;1543421W 1974-07-03	Mini	
Turnix nigricollis	FMNH 345612		Female Africa, Madagascar, Toliara, Fivondronana de Tolagnaro: Mandena Forest, 8 km NE Tolagnaro (Fort Dauphin) 1989-09-17	Zeiss 75	Gardner et al. (2012)
Turnix nigricollis	FMNH 436497	7 mirrored	Female Africa, Madagascar, Mahajanga: RNI de Namoroka, 32 km N Andranomavo -16.6666667, 45.33333333 2002-10-16	Zeiss 75	
Turnix ocellata	FMNH 478740		Male Asia, Philippines, Luzon, Cagayan: Penablanca Municipality, 19.4 km N, 9 km E Penablanca 17.80175, 121.86803 2011-06-22	Zeiss 75	
Turnix susciator	FMNH 515266		Female Asia, Philippines, Mindoro, Occidental Mindoro: Magsaysay Municipality, .02 km S, .02 km W Sta Teresa Hill, minimum elevation=90 2017-01-14	Zeiss 75	Naruangsri and Tiansawat (2016)

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Turnix sylvaticus	FMNH 289566		Captive	Zeiss 75	
Turnix sylvaticus	FMNH 291238	2 mirrored		Zeiss 75	
Turnix varia	FMNH 338535		Male Australasia, Australia 1963	Zeiss 75	
Uria aalge	FMNH 337986		Male North America; USA: California, Orange Co; Bolsa Chica 1982-12-01	Zeiss 250	
Uria aalge	LACM 100702		D and D Disposal Female 445g North America; United States; California; Los Angeles Co; Hermosa Beach 33 50 00 N, 118 28 00 W 21 Dec 1982	Mini	
Uria lomvia	USNM 488674		C. Hunter Male North America, United States, Alaska, Little Tanaya Island, 10 mi S, 51 37 – N, 176 – – W 1863-08-20	Mini	
Uria lomvia	FMNH 105266		Male North America; Greenland, Liverpool Land, Rathbone's Id 1936-08-06	Zeiss 75	
Vanellus albiceps	FMNH 313288		Africa, Gabon 1952	Zeiss 250	NatureFootage (2019)*
Vanellus albiceps	FMNH 313055	7 mirrored	Female Africa, Gabon 1952	Zeiss 75	
Vanellus armatus	FMNH 503731		Female Africa, Gabon 1952	Zeiss 75	Djuma Private Game Reserve, (2018)*
Vanellus armatus	ROM 156886		Africa, South Africa, Mpumalanga: Chrissie's Place 2005-10-03	Mini	
Vanellus cayanus	FMNH 291736		South America, Peru, Madre de Dios; Alto Rio Madre de Dios	Zeiss 75	Vidoz et al. (2010)
Vanellus chilensis	LACM 117310		Collins, C.T. South America, Venzuela, Barinas, 15 km E of Barinas 1981-01-15	Mini	Petrelesli (2015)*
Vanellus chilensis	FMNH 106242	1 mirrored	Male Captive specimen 1948-09	Zeiss 75	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Vanellus coronatus	FMNH 368825		Male Africa, Kenya, Eastern: Uraubuli Luggar, 30 mi N Loiyangalani 1959-02-06	Zeiss 75	
Vanellus coronatus	LACM 117308	23 mirrored	Male Africa, South Africa, Free State, Bloemfontein, Meriba 24 Sep 1987	Mini	
Vanellus crassirostris	USNM 291429		W. Brown Female Africa, Sudan, Al Buhayrat Shambe 1928-03-07	Mini	
Vanellus duvaucelli	USNM 429213		H. Deignan Male Asia, Thailand, Kanchanaburi, Hin Laem 1952-11-15	Mini	Escapes into the Wild (2017)*
Vanellus indicus	USNM 645821			Mini	Amar-Singh HSS (2019)*
Vanellus indicus	USNM 645981	25 mirrored		Mini	
Vanellus leucrurus	USNM 645956		C. Vogelwede Female US Military Base: Asia, Iraq, Muhafazat Salah ad Din, Joint Base Balad 33 56.41 N, 44 21 69 E 2010-08-23	Mini	
Vanellus miles	FMNH 106376		Male Captive 1950-07	Zeiss 250	Lovelyjubbly2000 (2009)*
Vanellus miles	FMNH 105363		Male Captive 1937-05	Zeiss 75	
Vanellus resplendens	USNM 645378			Mini	Sarmiento (2010)
Vanellus resplendus	USNM 620756		J. Gerwin Male South America, Argentina, Tucuman, San Miguel De Tucuman, 5 km N, 50 km W 26 45 00 S,065 44 18 W 9 Oct 1995	Mini	
Vanellus senegallus	USNM 430408		R. Smithers Male Africa, Zimbabwe, Matabeleland North, Nyamandhlovu 1957-09-11	Mini	Gerlass et al. (2014)
Vanellus spinosus	FMNH 93433		Male Africa, Mali, Bamako: Sotuba, 7 km E 1934-03-31	Zeiss 75	YANG Edwin (2017)*
Vanellus spinosus	FMNH 368832	1 mirrored	Female Africa, Ethiopia, Gamo Gofa; Omo River, N of Delta in Lake Rudolf 1959-01-21	Zeiss 75	

Species Name	Specimen Number	Modification	Specimen Information	Scanner	Foraging Ref.
Vanellus tectus	FMNH 104512	8 mirrored	Female Captive 1943-09-15	Zeiss 75	Nachi (2010)*
Vanellus tricolor	USNM 490657		1966 Captive	Mini	Adrian Walsh (2014)*
Vanellus tricolor	ROM 111951		Male 208.6g 1971	Mini	
Vanellus vanellus	LACM 117304	14 estimated	From Polish Academy of Science Male Europe, Poland, South Poland, Nowy Tara 00 May 1987	Mini	Xnissy (2010)*
Vanellus vanellus	FMNH 105495		Female Captive 1937-11	Zeiss 75	
Xema sabini	LACM 87248	1 mirrored	Willet, G.W. Female North America, US, California, Los Angeles, San Pedro, 33 45 N, 118 19 00 W 1928-10-14	Mini	Day and Nigro (2000)
Xema sabini	USNM 553905	2 mirrored, 2 estimated	D. Noble Female Arctic Ocean, Chukchi Sea 7115 – N, 15857 – W 1974-08-12	Mini	
Xenus cinereus	USNM 633448		P. Windler et al., Female US Military Base: Asia, Korea, Jeollabuk, Kunsan Air Base, 35 53 N, 126 38 W 2004-10-12	Mini	Tugumi (2006)*
Xenus cinereus	ROM 0159633	95 estimated	Baker, A.J., Georeferenced by Bradley G. Millen Male Oceania; Australia; Western Australia, Broome Bird Observatory, Fish Heads Beach 175800S; 1222000E 1996-03-23	Mini	

Landmarks used in this study

Descriptions of landmarks used throughout Chapter 2 and 3 are available below. The number refers to position in the landmark spreadsheets. Also provided is a description of the placement of that landmark, whether it was assigned to the beak (Bk) or braincase (Br) analysis (see main text) and the source from which we based the landmark. A value of NA under source denotes original landmarks included in this study.

Table 2: Landmarks Used in this Study.

Number	Description	Beak/Braincase	Source
1	Most anterior point on basisphenoid along the midline	Br	Olsen (2016)
2	Most posterior point on basisphenoid along the midline	Bk	Olsen (2016)
3	Medial point along occipital crest	Bk	Olsen (2016)
4	Most posterior point on foramen magnum along the midline	Br	Olsen (2016)
5	Point where jugal meets quadrate, left side	Bk	Olsen and Westneat (2016)
6	Point where jugal meets quadrate, right side	Bk	Olsen and Westneat (2016)
7	Point where jugal meets upper beak, right side	Bk	Olsen and Westneat (2016)
8	Point where jugal meets upper beak, left side	Bk	Olsen and Westneat (2016)
9	Left quadrate: lateral mandibular condyle	Bk	Olsen and Westneat (2016)

Number	Description	Beak/Braincase	Source
10	Right quadrate: lateral mandibular condyle	Bk	Olsen and Westneat (2016)
11	Right quadrate: medial mandibular condyle	Bk	Olsen and Westneat (2016)
12	Left quadrate: medial mandibular condyle	Bk	Olsen and Westneat (2016)
13	Left quadrate; lateral condyle of otic process	Bk	Olsen and Westneat (2016)
14	Right quadrate: lateral condyle of otic process	Bk	Olsen and Westneat (2016)
15	Right quadrate: medial condyle of otic process	Bk	Olsen and Westneat (2016)
16	Left quadrate: medial condyle of otic process	Bk	Olsen and Westneat (2016)
17	Center of occipital condyle at anterior opening of foramen magnum	Br	Olsen (2016)
18	Left quadrate: most dorsal part of the orbital process	Bk	Olsen and Westneat (2016)
19	Right quadrate: most dorsal part of the orbital process	Bk	Olsen and Westneat (2016)
20	Most posterior point along left opisthotic process (aka paraoccipital process), in groove	Br	Olsen (2016)
21	Most posesterior point along right opisthotic process (aka paraoccipital process), in groove	Br	Olsen (2016)

Number	Description	Beak/Braincase	Source
22	Left palatine: anterior most point on the lateral crest of the palatine	Bk	Olsen and Westneat (2016)
23	Right palatine: anterior most point on the lateral crest of the palatine	Bk	Olsen and Westneat (2016)
24	Right palatine: posterior most point on the lateral crest of the palatine	Bk	Olsen and Westneat (2016)
25	Left palatine: posterior most point on the lateral crest of the palatine	Bk	Olsen and Westneat (2016)
26	Left palatine; anterior most point on the medial palatine crest	Bk	Olsen and Westneat (2016)
27	Right palatine; anterior most point on the medial palatine crest	Bk	Olsen and Westneat (2016)
28	Right palatine; posterior most point on the medial palatine crest	Bk	Olsen and Westneat (2016)
29	Left palatine; posterior most point on the medial palatine crest	Bk	Olsen and Westneat (2016)
30	Left side: where palatine meets pterygoid	Bk	Olsen and Westneat (2016)
31	Right side; where palatine meets pterygoid	Bk	Olsen and Westneat (2016)
32	Most dorsal point on left orbit	Br	NA
33	Most dorsal point on left orbit	Br	NA
34	Most posterior point on right orbit	Br	NA
35	Most posterior point on left orbit	Br	NA

Number	Description	Beak/Braincase	Source
36	Point where palatine meets pterygoid, left side	Bk	Olsen and Westneat (2016)
37	Point where palatine meets pterygoid, right side	Bk	Olsen and Westneat (2016)
38	Most distal point on the beak	Bk	Olsen and Westneat (2016)
39	Left side, point where beak joins braincase on frontal bones	Br	NA
40	Right side, point where beak joins braincase on frontal bones	Br	NA
41	Right side, most rostral point along frontal or prefrontal bones in front of orbit	Br	NA
42	Left side, most rostral point along frontal or prefrontal bones in front of orbit	Br	NA
43-70	Semilandmarks running along the sagittal plane from the frontal-nasal hinge to the medial point on the occipital crest	Br	Olsen (2016)
71-92	Semilandmarks running along proximal curve on the left palatine	Bk	Olsen (2016)
93-114	Semilandmarks running along proximal curve on the right palatine	Bk	Olsen (2016)
115-163	Semilandmarks running along top of the beak	Bk	Olsen (2016)

Number	Description	Beak/Braincase	Source
164-209	Semilandmarks running along the right side of the beak	Bk	Olsen (2016)
210-255	Semilandmarks running along the left side of the beak	Bk	Olsen (2016)

The Use of Coarsely-defined Foraging Guild Classifications

Foraging ecology is inherently complex, making it a challenging life history variable to quantify or classify for comparative analysis. To examine the impact of using more coarsely defined guilds in macroevolutionary analyses of shape evolution, we collapsed the 36 refined guilds used in Chapter 2 into one of 10 more coarse guilds (summarized in table 3.1 in the main text) and re-ran our phylogenetic ANOVAs using these more broadly defined foraging guilds. These coarse guilds did not consider seasonality and were defined to delimit species that forage in generally similar ways (e.g., birds that dive, irrespective of dive depth or foraging technique). When we used our coarse guild categories, the amount of skull, beak, and braincase shape variation attributable to foraging ecology was substantially lower at $\sim$25, $\sim$29, and $\sim$22%, respectively, relative to the analyses using more refined categories that are presented in the main text. Full results using these coarse foraging guilds can be found in supplementary table 3.

Foraging Guild Classification Categories

Following the classification scheme of DeGraaf et al. (1985), we classified ecological niche by defining the mechanism of foraging and substrate in which foraging occurs for both the breeding and the non-breeding season of each species. We combined these classifications to place each species into a foraging guild for each season. The example species listed for each category below are not meant to be exhaustive but meant to give some representative examples of the species

Table 3: The results presented above are from a series of ANOVAs assessing the impact of coarsely-defined foraging ecology, body mass, and the interaction between the two on whole skull, beak,and braincase shape. The beak includes structures (the palatines, ptyergoids, quadrates) that are biomechanically associated with the beak

Structure	Coarse Ecology	Body Mass	Interaction
Whole skull	R^2 = 0.26, $F_{9,242}$ =10.80, Z = 7.25, P= 0.001	R^2 = 0.03, $F_{1,242}$ = 12.92, Z = 3.79, P = 0.001	R^2 = 0.04, $F_{9,242}$ =1.73, Z = 2.32, P = 0.007
Beak	R^2 = 0.29, $F_{9,242}$ = 12.39, Z = 7.90, P = 0.001	R^2 = 0.017, $F_{1,242}$ = 6.61, Z = 3.02, P = 0.002	R^2 = 0.04, $F_{9,242}$ = 1.85, Z = 2.51, P = 0.003
Braincase	R^2 = 0.22, $F_{9,242}$ = 9.38, Z = 7.59, P = 0.001	R^2 = 0.07, $F_{1,242}$ = 27.52, Z = 4.50, P = 0.001	R^2 = 0.04 $F_{9,242}$ = 1.58, Z = 1.76, P = 0.040

included in each category. The specific category each species was assigned to in both the breeding and non-breeding season are available in Dryad at: `https://doi.org/10.5061/dryad.pc866t1p0`

Techniques

Facultative Prober: Species noted to spend the majority of time probing (up to half, when quantified) in soft sediments, but also noted to peck or perform other behaviors such as 'jabbing'. Attempts to capture importance of tactile feeding method. E.g. many sandpipers.

Facultative Ground Forager: Noted to be predominantly a pecking/ground foraging species, but will also perform other behaviors infrequently like probing. This class excludes species that forage on the ground and will also hawk. Additionally this excludes birds that peck at plant material. E.g. many sandpipers, plovers, lapwings, some gulls.

Ground Forager: Species noted to predominantly peck at prey. Note that this is independent of what the 'ground' is. 'Gleaning' is collapsed into this category. Species that foot tremble frequently are also included here, as the foot trembling behavior suggests a reliance on visual foraging techniques that this category is meant to encapsulate. E.g. many plovers, jacanas.

Predator: Species noted to feed by picking prey items from the ground, meant to encapsulate

the difference between species that peck and those included here who pick prey items from various surfaces. E.g. skuas.

Prober: Species noted to predominantly forage via probing into soft sediments. Species that occasionally peck or pick items off of the ground are still included, as long as probing is the predominant mechanism. E.g. woodcocks, snipes.

Grazer: Species feeds predominantly on grasses or seeds, species that also take a proportion of insects among vegetation are included in this category. E.g. seedsnipes, buttonquails.

Pursuit Diver: Species performs extended dives from the surface of the water, using wings to propel forward, body fully submerged while foraging. E.g. alcids.

Dipper: Species performs hover or contact dipping where the body is not submerged but diving from air to surface of water where prey is 'picked' from surface. E.g. many species of terns, gulls.

Plunge Diver: Species uses mixtures of surface plunging or plunge diving species. E.g. many gulls, terns.

Facultative Scyther: Species that feed often by moving bill through water (scything) while wading, but are also noted to do a mix of other behaviors such as probing and taking prey from water's surface. E.g. avocets, stilts.

Facultative Terrestrial Forager: Species that do a mix of ground foraging and hawking. E.g. pratincoles.

Surface Plunger: Species that plunge from the air to the surface of the water, submerging only part of their body to remove food items. E.g. many terns, gulls.

Hawker: Species feed while flying in the air. E.g. coursers, pratincoles.

Aquatic Scavenger: Species widely regarded to feed in various mechanisms including hawking, eating hard shelled prey, diving, scavenging etc... Category restricted to species that scavenge in one way or another; this includes pirating behaviors as well as consumption of trash or other human food sources. E.g. many gulls.

Facultative Diver: Species performs a variety of diving behaviors, notably a mix of dipping

and plunging behaviors. If species are also noted to swim and take prey from surface either while swimming or skimming, this is included. Meant to encapsulate species that feed in aquatic environments in a variety of ways. E.g. many species of gull and terns.

Skimmer: Species forages by flying low over surface of water and dragging beak through water. E.g. skimmers.

Sediments

Air: Food item taken in the air. E.g. some coursers.

Arid Ground: Species feeds on the surface of dry, arid ground as such as in deserts. E.g. some thick-knee species, some pratincoles.

Lower canopy: Species feeds on leaves, twigs, and branches of shrubs, saplings, and lower crowns of trees, typical of tundra or desert environments (as opposed to grassland). E.g. seed-snipes, buttonquails.

Marsh: Foraging is done in fresh, brackish, or saltwater marshes (on mud, shallow water, or on marsh plants) as well as bogs and swamps. These are wetlands that are dominated by herbaceous vegetation and are wet often with standing water available. Species feeds among marsh vegetation/ in shallow water or down into sediment such as mud or peat. E.g. many sandpipers and relatives.

Meadow: Species forages on landscapes that are open with mostly low vegetation, such as grasslands or savannas. Also includes farms and ranches characterized by low amounts of trees with birds feeding in low, relatively dense vegetation. Environment is not characterised by being wet or aquatic even if there may be micro-fluctuations in moisture levels. E.g. many plovers, lapwings.

Pelagic: Foraging occurs in open waters, feeding entirely underwater, whole body is submerged within water. E.g alcids.

Rocky Shores: Feeding occurs along shorelines, but explicitly noted to occur among rocky shores characterized by larger rocks as opposed to sand. E.g. many oystercatchers, some sand-

pipers.

Semi-aquatic generalist: Refers to those that feed in a mix of shorelines and marshes, foraging not specific to sandy beaches or marsh habitats. E.g. many sandpipers and relatives.

Shallow water: Species feeds while wading and submerging bill and or whole head, water is reachable to bird from wading position. E.g. avocets, stilts.

Wet and Dry meadow: Foraging occurs in a mix of marsh and meadow, species noted to feed a mixture of dry and wet vegetation. E.g. many plovers, lapwings.

Water: Species that feed both on surface of water and deeper underwater such that the whole body would be submerged. E.g. many gulls, terns.

Water surface: Foraging occurs on the surface of fresh-, brackish, or saltwater habitats. Includes dipping or surface plunging behaviors as well as skimming. Meant to encapsulate lack of body submergence. E.g. skimmers, many gulls, terns.

Generalist: Found in disparate habitat types that do not fit one of the categories above, this classification is used restrictively for aquatic scavengers. E.g. many gulls.

Additional Information on Body Mass and Centroid Size

In Chapter 2, we chose to use body mass data (transformed due to the volumetric nature of this measurement) taken from previous literature as opposed to centroid size from our landmark data. This was based on distinct scaling relationships between body mass and centroid size - when taken from either the whole skull (figure 1) or from a subset of data that excluded the beak (figures 2, 3) - seen in various subsets of Charadriiformes. The graphs below demonstrate these relationships. All centroid size data was abnormally distributed and therefore was log transformed for these exploratory analyses.

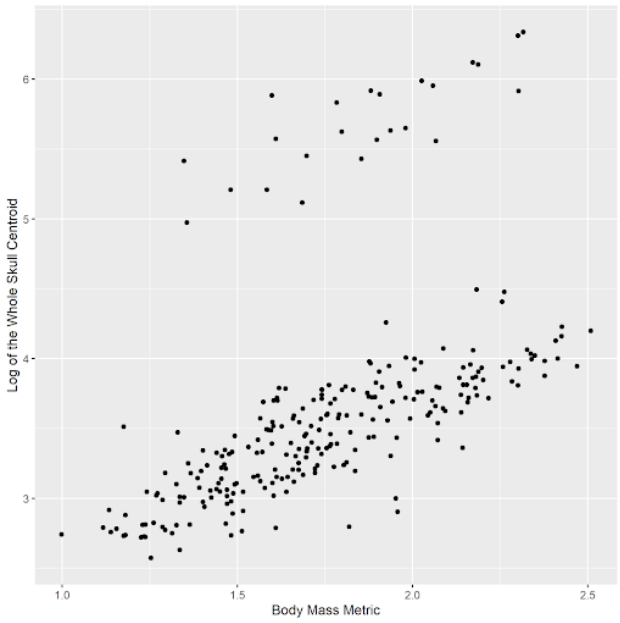

Figure 1: Log of the cube root of the body mass for each species against log of the centroid size taken from all 255 landmarks used ('whole skull' centroid size). Note the population of points with large centroid size relative to body mass.

Chapter 2 Results Using Breeding-Season Specific Foraging Data

As stated in the methods of Chapter 2, we ran all analyses twice. One iteration used the non-breeding season specific foraging guild and the other, the breeding season specific foraging guild. The results we recovered were largely similar in both iterations, so we report just the non-breeding season specific data in our main text. Here, we report the results using our breeding season specific foraging data. The sections follow the same sections in the main text Chapter 2 and, both here and in our main text, we make particular note of where results differed. We only re-ran portions of our analysis that required foraging data (e.g. Question 2 "Has allometry evolved in Charadriiformes?" was not re-run).

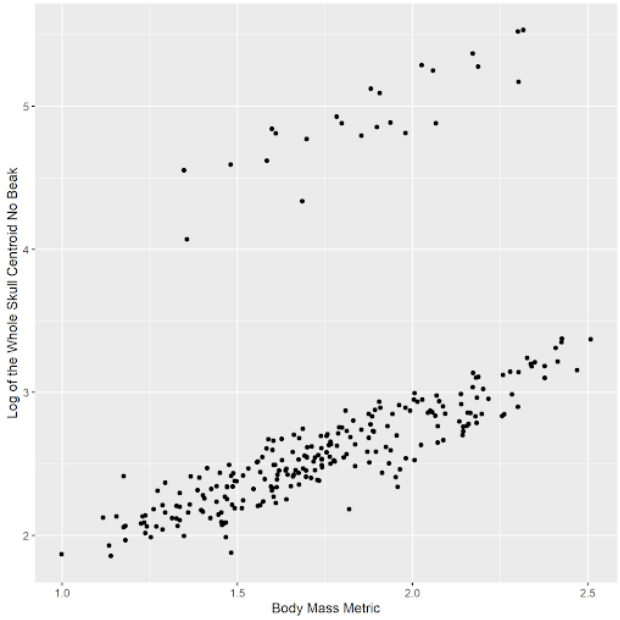

Figure 2: Log of the cube root of the body mass against log of the centroid size based on braincase landmarks only (see table 2). Note the population of points with large braincase centroid size relative to body mass.

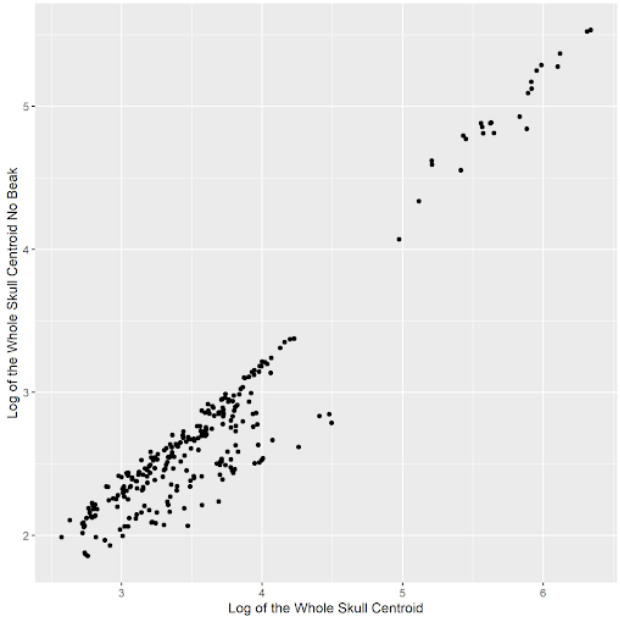

Figure 3: Log of the centroid size of the whole skull against log of the centroid size based on braincase landmarks only (see table 2). Note the relationship observed in figure 2 has disappeared, suggesting braincase allometry drives whole skull centroid size.

Table 4: Procrustes ANOVAs using breeding season specific foraging ecology.

Structure	Ecology	Body mass	Interaction
Whole Skull	R^2 = 0.70, $F_{33,186}$ = 23.24, Z = 16.16, P = 0.001	R^2 = 0.02, $F_{1,186}$ = 17.32, Z = 3.48, P = 0.001	R^2 = 0.07, $F_{33,186}$ =2.29, Z = 5.58, P = 0.001
Beak	R^2 = 0.73, $F_{33,186}$ = 24.05, Z = 16.66, P = 0.001	R^2 = 0.01, $F_{1,186}$ = 6.23, Z = 2.72, P = 0.002	R^2 = 0.07, $F_{33,186}$ = 2.23, Z = 5.38, P = 0.001
Braincase	R^2 = 0.44, $F_{33,186}$ = 8.16, Z = 11.90, P = 0.001	R^2 = 0.07, $F_{1,186}$ = 41.12, Z = 4.65, P = 0.001	R^2 = 0.11 $F_{33,186}$ = 2.00, Z = 4.40, P = 0.001

NOTE.- The results presented above result from a series of ANOVAs assessing the impact of body mass, breeding season foraging ecology, and the interaction between the two on whole skull, beak, and braincase shape.

Question 1: How Well Do Body Mass and Foraging Ecology Predict Charadriiform Skull Shape?

When we assessed the amount of variance in shape of the whole skull, beak, and braincase explained by breeding-season specific foraging guild, body mass, and the interaction between the two, we found results broadly similar to that using the non-breeding season specific foraging guild (table 4). All predictor variables (foraging ecology, body mass, and the interaction between the two) were significant predictors of shape ($P < 0.05$) in the whole skull, beak, and braincase analysis, and (consistent with the results reported in the main text), foraging ecology consistently explained a larger portion of shape variation than body mass. Foraging ecology explained $\sim$70% of whole skull shape, $\sim$73% of beak shape, and $\sim$44% of braincase shape. Body mass explained $\sim$2% of whole skull shape, $\sim$0.5% of beak shape, and $\sim$7% of braincase shape. The interaction between foraging ecology and body mass explained $\sim$7% of whole skull shape and beak shape, and $\sim$11% of braincase shape.

Question 3: Is Allometry of Variable Importance in Charadriiform Families?

With the use of breeding-season specific foraging ecology data, we also recovered variable relationships between foraging ecology, body mass, and skull shape across distinct charadriiform families (figure 5). These results differed slightly than when our non-breeding season foraging guild was used. For the family Scolopacidae (sandpipers and relatives), foraging ecology explained ∼32% of skull shape variation, body mass ∼16%, and the interaction between foraging ecology and body mass was not significant. For the Charadriidae (plovers, lapwings, and relatives), foraging ecology did not significantly relate to skull shape which contrasts with our results using non-breeding season specific data where foraging ecology explained ∼19% of skull shape variation. In this family, body mass did explain a significant portion of skull shape (at ∼10%), as did the interaction between body mass and foraging ecology (at ∼23%). For the Laridae (gulls, terns, and relatives), foraging ecology explained ∼19% of skull shape variation (lower than the ∼23% explained when non-breeding season foraging guilds were used), body mass explained ∼8%, and the interaction between these two factors explained ∼9%. Because our Alcidae analysis did not test for the explanatory power of foraging ecology (since all alcids share one foraging mode), these results were identical to that reported in the main manuscript Chapter 2.

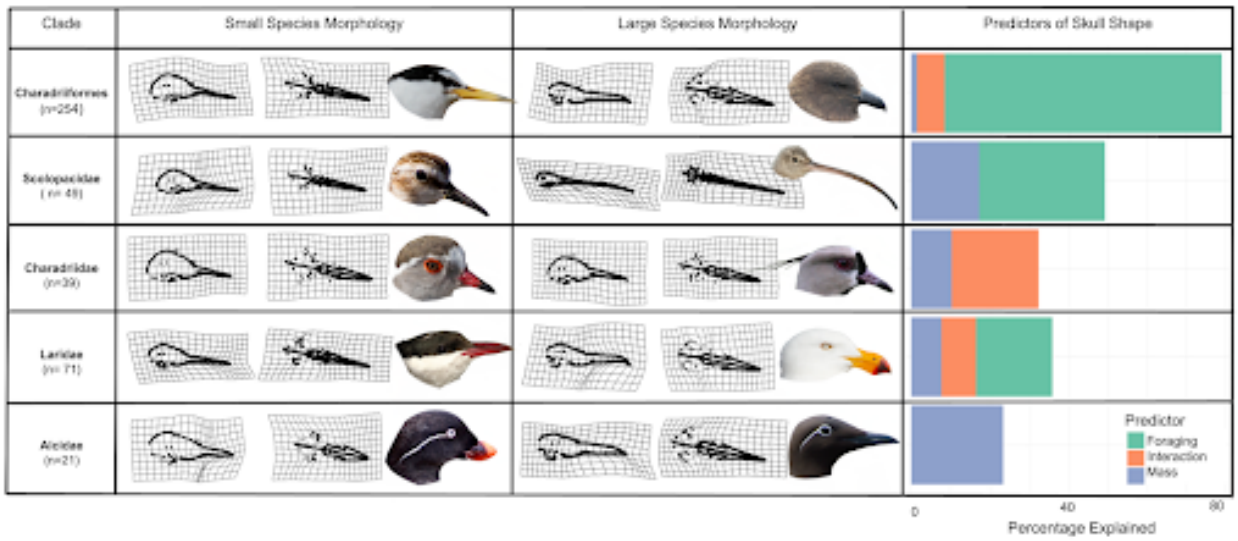

Figure 4: This figure is identical to figure 2.4 in the main text, except that the results here are based on the foraging guilds for the breeding season.

Image Licensing Information

Below is the full information on the image licensing from figure 2.4 in the main text.

Table 5: Credits and licensing information for images in Figure 2.4 of the main text and Figures 4 and 5. Supplementary figure 5 the corresponding image numbers labeled.

Image	Species	Owner	License	Link
1	Little tern	Agustín Povedano	CC BY-2.0	https://commons.wikimedia.org/wiki/File:Charrancito_Sternula_albifrons_1.jpg
2	Brown skua	Zakhar V. Akulov	CC BY-SA 3.0	https://commons.wikimedia.org/wiki/File:Catharacta-antarctica-9223.JPG
3	Least Sandpiper	Fernando Flores	CC BY-SA 2.0	https://commons.wikimedia.org/wiki/File:Least_Sandpiper_-_Playerito_Menudo_(Calidris_minutilla)_(10294690986).jpg
4	Far Eastern Curlew	John Harrison	CC BY-SA 4.0	https://commons.wikimedia.org/wiki/File:Numenius_madagascariensis_2_-_Stockton_Sandspit.jpg
5	Three banded plover	Charles J. Sharp	CC BY- SA 4.0	https://commons.wikimedia.org/wiki/File:Three-banded_plover_(Charadrius_tricollaris).jpg
6	Southern Lapwing	mdf	CC BY-S.A. 3.0- migrated	https://commons.wikimedia.org/wiki/File:Vanellus-chilensis-001.jpg
7	Whiskered Tern	Derek Keats	CC BY 2.0	https://upload.wikimedia.org/wikipedia/commons/0/0a/Whiskered_Tern%2C_Chlidonias_hybridus_at_Marievale_Nature_Reserve%2C_Gauteng%2C_South_Africa_%2831846158234%29.jpg
8	Pacific Gull	JJ Harrison	CC BY-SA 3.0	https://commons.wikimedia.org/wiki/File:Larus_pacificus_-_Derwent_River_Estuary.jpg
8	Parakeet Auklet	Dave Govoni	CC BY-NC-SA 2.0	https://live.staticflickr.com/4256/35189010870_29f12af183_o_d.jpg
9	Common Murre	thelastweasel′ on flickr	CC BY-SA 2.0	https://www.flickr.com/photos/120694055@N06/28841683258/in/photolist-KWDaB1-2gtYWiC-27y7vZt-Wq6Sf5-jbVz9-W5tWrX-akB9bY-nhRjKM-2gA4JRe-7kLNk-4pxEwR-puvKEY-6s6ARJ-2gPZh7f-2giQdHj-6s21aa-6s21hr-b3EFea-K7n3bx-KejDvP-2hd4AQs-LNohWG-9Y7JZE-2gTjthX-2hh2j3K-K7n7h8-c9r3GA-9P93Dh-9esJC6-2h5bCMH-JhUMWr-JhUKL4-JhUNZD-K59kB3-JMRUw9-Jzw3Py-38uHBV-5t6vdz-VfW9h5-dzJ6CK-KqRabm-eMTKto-2h4TwDu-nzoLbs-b1WH6-eMTK5y-Lk85PT-f5Qnv3-mKPLP-UBzcRB

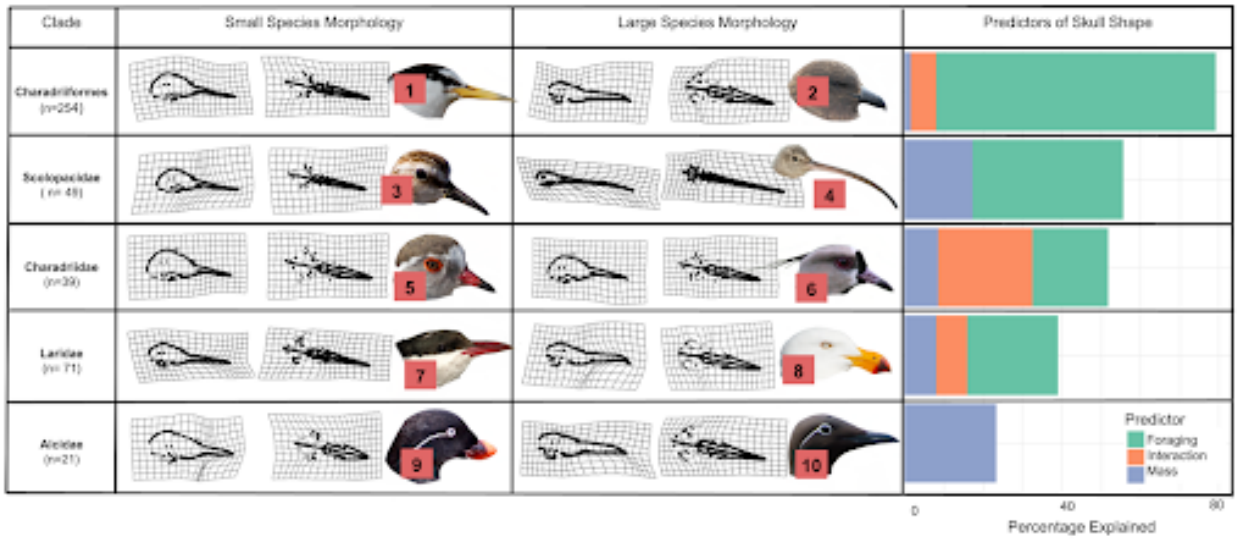

Figure 5: This figure is identical to figure 3 in the main text. Listed above in supplementary table 5 are the sources of each image used.

Written descriptions of modularity hypotheses tested

Table 6: Descriptions of each of the 11 modularity hypothesis compared. The abbreviation used for each hypotheses is given in the lefthand column with the number inside the parenthesis following each name denoting the number of modules in that hypothesis. These descriptions refer to the beak and braincase hypothesis 1 (BKBR1) and beak and braincase hypothesis 2 (BKBR2) and the FeliceGoswami (FG) hypothesis and it's 8 variations (FG1, FG2 etc...).The righthand column includes hypothesized modules, separated by brackets, with the anatomical elements included in each hypothesized module given by distinct letter codes. The abbreviations for each anatomical element are: F (frontal), O (orbit), Po (post-orbit), Fm (foramen magnum), B (basisphenoid), Pl (palatine), Pt (pyergoid), Q (quadrate), J (jugal) and Pm (premaxilla).

Hypothesis	Modules
FG (7)	[F,O,Po][Fm][B][Pl][Pt][Q][J,Pm]
FG1 (7)	[F(part),O,Po][Fm][B][Pl][Pt][Q][F(part),J,Pm]
FG2 (8)	[F(part),O,Po][Fm][B][Pl][Pt][Q][F(part)][J,Pm]
FG3 (5)	[F,O,Po,Fm,J,Pm][B][Pl][Pt][Q]
FG4 (4)	[F,O,Po,Fm,B,J,Pm][Pl][Pt][Q]
FG5 (5)	[F,O,Po,B,J,Pm][Fm][Pl][Pt][Q]
FG6 (5)	[F,O,Po][Fm,B,J,Pm][Pl][Pt][Q]
FG7 (8)	[F,O][Po][Fm][B][Pl][Pt][Q][J,Pm]
FG8 (9)	[F,O][Po][Fm][B][Pl][Pt][Q][J][Pm]
BKBR1 (2)	[F,O,Po,Fm,B][Pl,Pt,Q,J,Pm]
BKBR2 (2)	[F,O,Po,Fm,B,Pl,Pt,Q,J][Pm]

Subgroup Assignments for Chapter 3

Table 7: Subgroup assignments for species studied in Chapter 3 of this dissertation.

Species Name	Suborder
Actitis hypoleucos	Scolopaci
Actitis macularia	Scolopaci
Actophilornis africanus	Scolopaci
Aethia cristatella	Lari
Aethia psittacula	Lari
Aethia pusilla	Lari
Aethia pygmaea	Lari
Alca torda	Lari
Alle alle	Lari
Anarhynchus frontalis	Charadrii
Anous minutus	Lari
Anous stolidus	Lari
Aphriza virgata	Scolopaci
Arenaria interpres	Scolopaci
Arenaria melanocephala	Scolopaci
Attagis gayi	Scolopaci
Attagis malouinus	Scolopaci
Bartramia longicauda	Scolopaci
Brachyramphus brevirostris	Lari
Brachyramphus marmoratus	Lari

Species Name	Suborder
Burhinus bistriatus	Charadrii
Burhinus capensis	Charadrii
Burhinus oedicnemus	Charadrii
Burhinus senegalensis	Charadrii
Burhinus superciliaris	Charadrii
Burhinus vermiculatus	Charadrii
Calidris acuminata	Scolopaci
Calidris alba	Scolopaci
Calidris alpina	Scolopaci
Calidris bairdii	Scolopaci
Calidris canutus	Scolopaci
Calidris ferruginea	Scolopaci
Calidris fuscicollis	Scolopaci
Calidris himantopus	Scolopaci
Calidris maritima	Scolopaci
Calidris mauri	Scolopaci
Calidris melanotos	Scolopaci
Calidris minuta	Scolopaci
Calidris minutilla	Scolopaci
Calidris ptilocnemis	Scolopaci
Calidris pusilla	Scolopaci
Calidris ruficollis	Scolopaci
Calidris tenuirostris	Scolopaci
Catharacta antarctica	Lari
Catharacta maccormicki	Lari

Species Name	Suborder
Catharacta skua	Lari
Catoptrophorus semipalmatus	Scolopaci
Cepphus carbo	Lari
Cepphus columba	Lari
Cepphus grylle	Lari
Cerorhinca monocerata	Lari
Charadrius alexandrinus	Charadrii
Charadrius asiaticus	Charadrii
Charadrius australis	Charadrii
Charadrius bicinctus	Charadrii
Charadrius collaris	Charadrii
Charadrius dubius	Charadrii
Charadrius falklandicus	Charadrii
Charadrius hiaticula	Charadrii
Charadrius leschenaultii	Charadrii
Charadrius marginatus	Charadrii
Charadrius melodus	Charadrii
Charadrius modestus	Charadrii
Charadrius montanus	Charadrii
Charadrius palidus	Charadrii
Charadrius pecuarius	Charadrii
Charadrius ruficapillus	Charadrii
Charadrius semipalmatus	Charadrii
Charadrius tricollaris	Charadrii
Charadrius vociferus	Charadrii

Species Name	Suborder
Charadrius wilsonia	Charadrii
Chionis albus	Charadrii
Chlidonias hybrida	Lari
Chlidonias leucopterus	Lari
Chlidonias nigra	Lari
Creagrus furcatus	Lari
Cursorius cursor	Lari
Cursorius temminckii	Lari
Dromas ardeola	Lari
Elseyornis melanops	Charadrii
Esacus magnirostris	Charadrii
Eudromias morinellus	Charadrii
Fratercula arctica	Lari
Fratercula cirrhata	Lari
Fratercula corniculata	Lari
Gallinago gallinago	Scolopaci
Gallinago hardwickii	Scolopaci
Gallinago media	Scolopaci
Gallinago megala	Scolopaci
Gallinago nigripennis	Scolopaci
Gallinago paraguaiae	Scolopaci
Gallinago stenura	Scolopaci
Glareola maldivarum	Lari
Glareola nordmanni	Lari
Glareola nuchalis	Lari

Species Name	Suborder
Glareola pratincola	Lari
Gygis alba	Lari
Haematopus ater	Charadrii
Haematopus bachmani	Charadrii
Haematopus finschi	Charadrii
Haematopus fuliginosus	Charadrii
Haematopus leucopodus	Charadrii
Haematopus moquini	Charadrii
Haematopus ostralegus	Charadrii
Haematopus palliatus	Charadrii
Haematopus unicolor	Charadrii
Heteroscelus brevipes	Scolopaci
Heteroscelus incanus	Scolopaci
Himantopus himantopus	Charadrii
Himantopus melanurus	Charadrii
Himantopus mexicanus	Charadrii
Hydrophasianus chirurgus	Scolopaci
Ibidorhyncha struthersii	Charadrii
Irediparra gallinacea	Scolopaci
Jacana jacana	Scolopaci
Jacana spinosa	Scolopaci
Larosterna inca	Lari
Larus argentatus	Lari
Larus atlanticus	Lari
Larus atricilla	Lari

Species Name	Suborder
Larus audouinii	Lari
Larus bulleri	Lari
Larus cachinnans	Lari
Larus californicus	Lari
Larus canus	Lari
Larus cirrocephalus	Lari
Larus crassirostris	Lari
Larus delawarensis	Lari
Larus dominicanus	Lari
Larus fuliginosus	Lari
Larus fuscus	Lari
Larus genei	Lari
Larus glaucescens	Lari
Larus glaucoides	Lari
Larus hartlaubii	Lari
Larus heermanni	Lari
Larus hyperboreus	Lari
Larus ichthyaetus	Lari
Larus livens	Lari
Larus maculipennis	Lari
Larus marinus	Lari
Larus melanocephalus	Lari
Larus minutus	Lari
Larus modestus	Lari
Larus novaehollandiae	Lari

Species Name	Suborder
Larus occidentalis	Lari
Larus pacificus	Lari
Larus philadelphia	Lari
Larus pipixcan	Lari
Larus ridibundus	Lari
Larus schistisagus	Lari
Larus serranus	Lari
Larus thayeri	Lari
Leucophaeus scoresbii	Lari
Limnodromus griseus	Scolopaci
Limnodromus scolopaceus	Scolopaci
Limosa fedoa	Scolopaci
Limosa haemastica	Scolopaci
Limosa lapponica	Scolopaci
Limosa limosa	Scolopaci
Lymnocryptes minimus	Scolopaci
Metopidius indicus	Scolopaci
Microparra capensis	Scolopaci
Numenius americanus	Scolopaci
Numenius arquata	Scolopaci
Numenius madagascariensis	Scolopaci
Numenius minutus	Scolopaci
Numenius phaeopus	Scolopaci
Numenius tahitiensis	Scolopaci
Oreopholus ruficollis	Charadrii

Species Name	Suborder
Pagophila eburnea	Lari
Phaetusa simplex	Lari
Phalaropus fulicarius	Scolopaci
Phalaropus lobatus	Scolopaci
Philomachus pugnax	Scolopaci
Pluvialis apricaria	Scolopaci
Pluvialis dominica	Charadrii
Pluvialis fulva	Scolopaci
Pluvialis squatarola	Charadrii
Pluvianus aegyptius	Charadrii
Ptychoramphus aleuticus	Lari
Recurvirostra americana	Scolopaci
Recurvirostra andina	Charadrii
Recurvirostra avosetta	Scolopaci
Rhinoptilus africanus	Lari
Rhinoptilus chalcopterus	Lari
Rhinoptilus cinctus	Lari
Rhodostethia rosea	Lari
Rissa brevirostris	Lari
Rissa tridactyla	Lari
Rostratula benghalensis	Scolopaci
Rostratula semicollaris	Scolopaci
Rynchops flavirostris	Lari
Rynchops niger	Lari
Scolopax minor	Scolopaci

Species Name	Suborder
Scolopax rusticola	Scolopaci
Steganopus tricolor	Scolopaci
Stercorarius longicaudus	Lari
Stercorarius parasiticus	Lari
Stercorarius pomarinus	Lari
Sterna albifrons	Lari
Sterna aleutica	Lari
Sterna anaethetus	Lari
Sterna antillarum	Lari
Sterna bengalensis	Lari
Sterna bergii	Lari
Sterna caspia	Lari
Sterna dougallii	Lari
Sterna elegans	Lari
Sterna forsteri	Lari
Sterna fuscata	Lari
Sterna hirundinacea	Lari
Sterna hirundo	Lari
Sterna lunata	Lari
Sterna maxima	Lari
Sterna nilotica	Lari
Sterna paradisaea	Lari
Sterna sandvicensis	Lari
Sterna striata	Lari
Sterna sumatrana	Lari

Species Name	Suborder
Sterna superciliaris	Lari
Sterna trudeaui	Lari
Sterna vittata	Lari
Stiltia isabella	Lari
Synthliboramphus antiquus	Lari
Synthliboramphus craveri	Lari
Synthliboramphus hypoleucus	Lari
Thinocorus orbignyianus	Scolopaci
Thinocorus rumicivorus	Scolopaci
Thinornis rubricollis	Charadrii
Tringa flavipes	Scolopaci
Tringa glareola	Scolopaci
Tringa melanoleuca	Scolopaci
Tringa nebularius	Scolopaci
Tringa ochropus	Scolopaci
Tringa solitaria	Scolopaci
Tringa stagnatilis	Scolopaci
Tringa totanus	Scolopaci
Tryngites subruficollis	Scolopaci
Turnix suscitator	Lari
Turnix sylvaticus	Lari
Turnix varius	Lari
Uria aalge	Lari
Uria lomvia	Lari
Vanellus albiceps	Charadrii

Species Name	Suborder
Vanellus armatus	Charadrii
Vanellus cayanus	Charadrii
Vanellus chilensis	Charadrii
Vanellus coronatus	Charadrii
Vanellus crassirostris	Charadrii
Vanellus duvaucelii	Charadrii
Vanellus indicus	Charadrii
Vanellus leucurus	Charadrii
Vanellus miles	Charadrii
Vanellus resplendens	Charadrii
Vanellus senegallus	Charadrii
Vanellus spinosus	Charadrii
Vanellus tectus	Charadrii
Vanellus tricolor	Charadrii
Vanellus vanellus	Charadrii
Xema sabini	Lari
Xenus cinereus	Scolopaci

Details on the Reduced Density Landmarking Scheme Used in Portions of Chapter 3

As mentioned, to ensure that the number of landmarks exceeded the number of specimens for the modularity analyses in Chapter 3, we used a reduced density landmark dataset. Four type 1 landmarks (table 2; landmark numbers 3, 22, 23, and 38) were removed and the density of semi-landmarks was reduced. Figure 6 provides a visual depiction of this landmarking scheme.

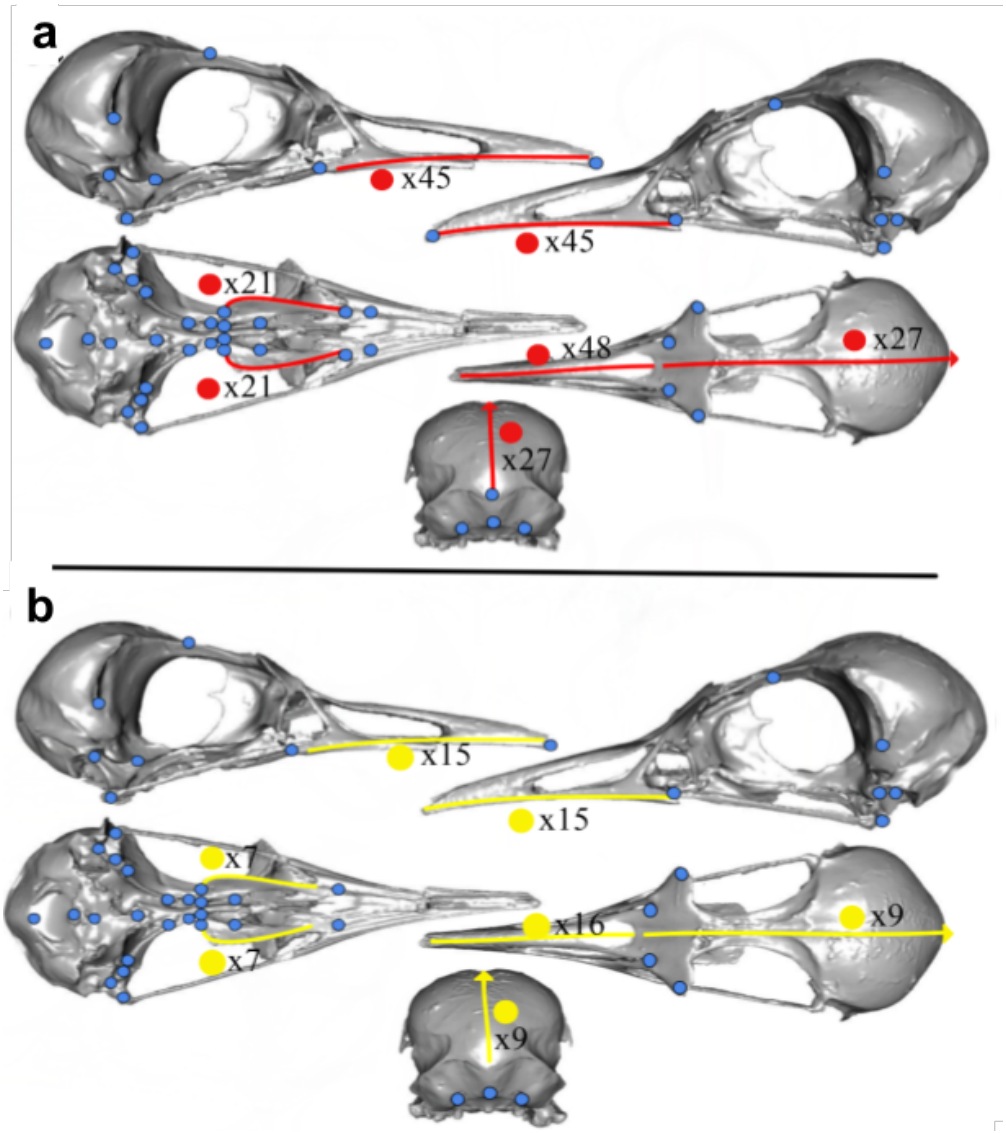

Figure 6: The reduced density landmarking scheme used in the modularity analyses of Chapter 3 (b) relative to the original density landmarking scheme used in all other analyses throughout Chapters 2 and 3 (a).

Specimens which linear measurements were collected from in Chapter 4

Below is a table with information on the specimens from which linear measurements were collected to be used in Chapter 4. Included is the species name, the specimen number (FMNH= Field Museum of Natural History; ROM= Royal Ontario Museum; USNM = Smithsonian Museum of Natural History; LACM= Natural History Museum of Los Angeles County).

Table 8: Specimens used in Chapter 4 analyses.

Species Name	Specimens
Actitis macularius	FMNH 452109, FMNH 105162,USNM 492836
Arenaria interpres	USNM 631457, USNM 622548, USNM 498031
Bartramia longicauda	FMNH 317850, FMNH 376174, USNM 610844
Calidris acuminata	USNM 638728
Calidris alba	FMNH 93243, FMNH 106696, USNM 489543
Calidris alpina	FMNH 376250, FMNH 376248, USNM 489583
Calidris bairdii	FMNH 106694, LACM 117465, USNM 5555308
Calidris canutus	FMNH 376221,USNM 622554
Calidris ferruginea	USNM 488340
Calidris fuscicollis	USNM 61614
Calidris himantopus	LACM 114330, USNM 500671
Calidris maritime	USNM 623283
Calidris mauri	FMNH 360225, FMNH 342545, USNM 491083
Calidris melanotos	FMNH 376243, USNM 499353
Calidris minutilla	FMNH 105219, FMNH 376239, USNM 641265

Species Name	Specimens
Calidris pugnax	USNM 557536
Calidris pusilla	FMNH 493833, USNM 289682
Calidris ruficollis	USNM 500796
Calidris subruficollis	LACM 87182, USNM 630312
Calidris virgata	FMNH 334729, LACM 11348, USNM 489303
Charadrius hiaticula	FMNH 368835, FMNH 363885, FMNH 368836
Charadrius melodus	FMNH 525459
Charadrius nivosus	FMNH 338418
Charadrius semipalmatus	FMNH 106701, FMNH 106699, USNM 489575
Charadrius vociferus	FMNH 356995, FMNH 475312, FMNH 510396
Charadrius wilsonia	LACM 110086, USNM 556652, USNM 613820
Chlidonias niger	LACM 113188, LACM 87257
Chroicocephalus philadelphia	FMNH 382230, FMNH 83283, FMNH 338261
Chroicocephalus ridibundus	FMNH 338256
Gallinago delicata	FMNH 462130
Gelochelidon nilotica	LACM 107801, LACM 120453, LACM 107573
Haematopus palliatus	USNM 622740
Himantopus mexicanus	USNM 556903
Hydrocoloeus minutus	ROM 124006
Hydroprogne caspia	LACM 117616, LACM 117677, LACM 110333
Larus argentatus	FMNH 314510, FMNH 291337, FMNH 291264
Larus californicus	FMNH 364181, LACM 100221, LACM 117527
Larus canus	LACM 117509, USNM 638922, USNM 622481
Larus crassirostris	USNM 633464, USNM 500780

Species Name	Specimens
Larus delawarensis	USNM 557574, USNM 557592
Larus fuscus	USNM 631721
Larus glaucescens	LACM 117554, LACM 100742, USNM 561231
Larus glaucoides	USNM 637972
Larus heermanni	LACM 87199, LACM 117493, LACM 100671
Larus hyperboreus	USNM 7364, USNM 17324
Larus marinus	FMNH 338219, LACM 117553, USNM 638692
Larus schistisagus	USNM 500781
Leucophaeus atricilla	FMNH 376259, FMNH 360243, FMNH 338231
Leucophaeus pipixcan	LACM 107638, USNM 19921, USNM 648284
Limnodromus griseus	LACM 113131, USNM 489576
Limnodromus scolopaceus	LACM 117432, LACM 87165, LACM 117431
Limosa fedoa	LACM 87096, USNM 225670, USNM 499319
Limosa haemastica	USNM 614609, USNM 489609, USNM 489608
Limosa lapponica	LACM 87092, USNM 555156, USNM 499267
Limosa limosa	FMNH 368848, FMNH 104480, USNM 320129
Numenius phaeopus	USNM 638770, USNM 638773, USNM 639075
Pagophila eburnea	USNM 344738
Phalaropus lobatus	USNM 492690, USNM 638829, USNM 18837
Phalaropus tricolor	LACM 117375, LACM 105163, USNM 499457
Pluvialis dominica	FMNH 334931, FMNH 105253
Pluvialis fulva	LACM 106883, USNM 622612
Pluvialis squatarola	FMNH 106702, FMNH 338400
Recurvirostra americana	LACM 117281
Rhodostethia rosea	USNM 491611, USNM 491609, USNM 491608

Species Name	Specimens
Rynchops niger	FMNH 342624, LACM 120034
Scolopax minor	LACM 113134
Stercorarius longicaudus	LACM 117484, LACM 117485
Stercorarius parasiticus	LACM 87186, LACM 87184, LACM 117483
Stercorarius pomarinus	LACM 117479
Sterna dougallii	FMNH 360247
Sterna forsteri	LACM 87266
Sterna hirundo	FMNH 432821
Sterna paradisaea	LACM 87265, LACM 100318, LACM 87264
Sternula antillarum	LACM 117670, LACM 117659, LACM 117669
Thalasseus elegans	LACM 117721, LACM 117719, USNM 612541
Thalasseus maximus	FMNH 360522, LACM 87277
Thalasseus sandvicensis	FMNH 363902
Tringa flavipes	FMNH 85721, FMNH 105222, FMNH 105222
Tringa glareola	FMNH 368853, USNM 642844
Tringa melanoleuca	FMNH 290819, FMNH 88433, USNM 630692
Tringa semipalmata	LACM 117365, LACM 117353, USNM 499449
Tringa solitaria	FMNH 428931, FMNH 438471, FMNH 376186
Vanellus vanellus	FMNH 106822, FMNH 105288, FMNH 376146
Xema sabini	LACM 87251, LACM 104292, USNM 557605
Xenus cinereus	USNM 488337, USNM 633449, USNM 633444

Dietary Information

Fuzzy encoded dietary data for each of the 85 species analyzed in Chapter 4. The species and the proportion of the diet composed of 7 different dietary item categories (AInv= aquatic invertebrates, Plt= plants, Tvert= terrestrial vertebrates, Fish, Egg = eggs, Crr= carrion, and Tinv= Terrestrial Invertebrates) is given along with an explanation "Expl" of how values were assigned based on information in the Handbook of the Birds of the World (del Hoyo et al., 1996).

Table 9: Summary of dietary ecology of each species in Chapter 4.

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Actitis macularius	0.475	0	0	0.05	0	0	0.475	Mainly aquatic and terrestrial insects =0.95 (divided by two); ”even small fish” noted = 0.05
Arenaria interpres	0.35	0.1	0.05	0.05	0.05	0.05	0.35	”some vegetable matter taken early in season”= 0.1; carrion; small fish; dead mammals; and eggs both noted to be used seaonally= 0.05 each ; diet noted to predominantly be invertbrates; with an even mix of terrestrial and aquatic invertebrates.
Bartramia longicauda	0	0.05	0	0	0	0	0.95	”chiefly consists of terrestrial insect”= 0.95 some seeds also noted =0.05
Calidris acuminata	0.33	0.33	0	0	0	0	0.33	Diet noted to be ”highly variable” with both aquatic and terrestrial insects mentioned as well as seeds- no quantities given so split evenly between the three
Calidris alba	0.375	0.05	0	0.05	0.1	0.05	0.375	Fish and carrion noted occasionally (0.05); eggs noted to be used heavily in certain locations (=0.1); vegetable matter ”also” noted (=0.05); otherwise a mixture of terrestrial and aquatic invertabrates noted to be main food source; depending on season
Calidris alpina	0.45	0.05	0	0.05	0	0	0.45	”occasionally” small fish and plant matter =0.05 each; otherwise noted to consume a variety of terrestrial and aquatic vertebrates (remaining portion of 0.9 divided by two; 0.45 each)
Calidris bairdii	0	0	0	0	0	0	1	Only terrestrial invertebrates and their larvae noted
Calidris canutus	0.4	0.05	0.05	0	0.1	0	0.4	Mostly aquatic and terrestrial invertbrates noted (0.8 split evenly between two). Eggs noted to be important in certain locations =0.1; fish and seeds rarely noted (=0.05 each)

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Calidris ferruginea	0.475	0.05	0	0	0	0	0.475	Seeds noted occasionally (=0.05); but otherwise, only aquatic and terrestrial inverbrates noted (0.95 split between two categories)
Calidris fuscicollis	0.45	0.1	0	0	0	0	0.45	”Some” seeds noted but otherwise listed food items are terrestrial and aquatic invertebrates so split 50/50 between these
Calidris himantopus	0.475	0.05	0	0	0	0	0.475	Seeds noted to be included (0.05) but otherwise main dietary items listed are aquatic and terrestrial invertebrates so split evenly between these two
Calidris maritima	0.425	0.15	0	0	0	0	0.425	Plant material (including berries and algae) noted = 0.1; otherwise numerous aquatic and terrestrial vertebrates noted so split rest evenly between these two categories
Calidris mauri	0.475	0.05	0	0	0	0	0.475	Seeds noted occasionally (=0.05); otherwise mixtures of aquatic and terrestrial vertebrates noted
Calidris melanotos	0.45	0.1	0	0	0	0	0.45	Algae and seeds noted in a certain time period (=0.1); variety of aquatic and terrestrial invertebrates otherwise noted so split evenly between these two
Calidris minutilla	0.45	0	0	0	0.1	0	0.45	Eggs noted (=0.1); otherwise aquatic and terrestrial invertebrates noted; so split evenly between these two categories (=0.45 each)
Calidris pugnax	0.4	0.15	0	0.05	0	0	0.4	Frogs and small fish noted in certain times and places (=0.05); plant matter including seeds is also noted in certain places (=0.05); otherwise noted to eat terrestrial and aquatic invertebrates so remaining portion split evenly between these two (=0.425 each).
Calidris pusilla	0.45	0.05	0	0	0.05	0	0.45	Eggs again noted in certain times and places (=0.05); seeds included in listed items (=0.05). Otherwise again noted to consume a variety of aquatic and terrestrial invertbrates so remainer split evenly between these two

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Calidris ruficollis	0.45	0.1	0	0	0	0	0.45	Seeds noted in both breeding and non-breeding season (=0.1); otherwise aquatic and terrestrial invertebrates noted so remainer split between these two categories.
Calidris subruficollis	0.15	0.05	0	0	0	0	0.8	Seeds noted in list (=0.05); otherwise predominantly terrestrial vertebrates noted; with some crustaceans mentioned.
Calidris virgata	0.475	0	0	0	0.05	0	0.475	Eggs noted in certain places/times; otherwise terrestrial and aquatic vertebrates noted so split remained between these two categories
Charadrius hiaticula	0.5	0	0	0	0	0	0.5	Only terrestrial and aquatic invertbrates mentioned.
Charadrius melodus	0.5	0	0	0	0	0	0.5	Aquatic and terrestrial invertebrates noted to both be the main food source
Charadrius nivosus	0.5	0	0	0	0	0	0.5	Noted only to eat various aquatic and terrestrial invertebrates with no quantities given; so split evenly between two categories
Charadrius semipalmatus	0.95	0	0	0	0	0	0.05	Primarily aquatic worms noted; but small amounts of terrestrial insects such as ants/beetles also noted
Charadrius vociferus	0.475	0.05	0	0	0	0	0.475	Some seeds noted (=0.05); but otherwise terrestrial insects and crustaceans noted so split evenly between these two categories (=0.475 each).
Charadrius wilsonia	1	0	0	0	0	0	0	Only aquatic invertebrates noted
Chlidonias niger	0.4	0	0	0.2	0	0	0.4	Fish and frogs noted to be about 20 percent of diet (=0.2); otherwise aquatic and terrestrial insects noted; depending on the season to be the main dietary items; so split remainder evenly between these two categories (=0.4 each).

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Chroicocephalus philadelphia	0.4	0	0	0.2	0	0	0.4	Fish and krill noted to be the main food sources; with varying importance- fish not noted to be particularly critical at any point hence =0.2; otherwise divided evenly among terrestrial and aquatic inverts since both are noted to be critical at certain times and places.
Chroicocephalus ridibundus	0.45	0.05	0	0.05	0	0	0.45	Fish and grains noted to be included but of much less importance (=0.05 each); otherwise noted to rely ”heavily” on aquatic and terrestrial insects/invertebrates so remaining portion split between these two (=0.45 each)
Gallinago delicata	0.2	0.05	0.025	0.025	0	0	0.7	Plant materials and small vertebrates (both fish and terrestrial vertebrates) are all noted to be small contributions to diets; so 0.05 to plant material and 0.025 to both aquatic and terrestrial vertebrates. Otherwise noted to predominantly feed on terrestrial invertebrates with a smaller amount of aquatic invertebrates.
Gelochelidon nilotica	0.175	0	0.15	0.175	0	0	0.5	”Rarely” noted to take voles and birds ; otherwise diet noted to be varied; with certain areas having heavy usage of insects (0.5 for terrestrial invertebrates) and others relying on vertebrates (=0.15 for terrestrial verts); fish and aquatic invertebrates also noted so split remainder between two. Noted to be opportunistic; more insectivorous than most other terns; prey including mainly grasshoppers; dragonflies; moths and grubs; also takes spiders; earthworms; small reptiles and frogs; small fish (mainly 6-9cm) and aquatic inverts; rarely voles and small birds. More varied diet and larger items in N Europe than in S. Europe. In Italy; 67% of food items were reptiles in one study; mostly insects in another. In Russian steppes; 80% Orthoptera

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Haematopus palliatus	1	0	0	0	0	0	0	No other prey items described but aquatic inverts- noted to form 97% of diet in certain places.
Himantopus mexicanus	0.475	0.05	0	0.475	0	0	0	Seeds and vegetation noted as tiny part of diet (=0.05); otherwise aquatic vertebrates and inverts noted to be dominant food source; so remaining portion divided by two.
Hydrocoloeus minutus	0.1	0	0	0.1	0	0	0.8	Fish noted to be small but significant portion of diet. Otherwise; insects noted to be important- mostly terrestrial insects mentioned.
Hydroprogne caspia	0	0	0	0.9	0.05	0.05	0	Carrion and eggs noted occasionally (so 0.05 each); otherwise noted to be mainly fish.
Larus argentatus	0.15	0.14	0.14	0.15	0.14	0.14	0.14	Diet noted to be extremely variable. Insects; birds/rodents; eggs;carrion; berries; fish; crabs and other aquatic invertebrates such as worms all noted with certain flocks often specializing. So importance is equally divided equally among 7 elements for the most part; slightly larger portion given to aquatic vertebrates (fish) and aquatic invertebrates since these are noted to be particularly important.
Larus californicus	0.166	0.166	0.166	0	0.166	0.166	0.17	Similar to L. argentatus- extremely opportunistic. Noted to feed extensively on insects; plant material ("Can be a serious pest at cherry and strawberry farms"); bird eggs; rodents/young birds; crabs; and carrion. Fish not mentioned- so remaining six categories all given equal weight
Larus canus	0.3	0.05	0.05	0.3	0	0	0.3	Noted to occasionally take terrestrial verbrates (birds and small mammals- so 0.05). Otherwise; noted to take predominantly terrestrial and aquatic invertebrates and fish; with grain being important seasonally

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Larus crassirostris	0.25	0	0	0.25	0	0.25	0.25	Diet noted to vary by space and time. Fish; aquatic inverbrates; insects and carrion noted to be most important
Larus delawarensis	0.166	0.166	0.166	0.166	0	0.166	0.17	Diet is highly varied. Fish; aquatic and terrestrial invertebrates; terrestrial vertebrates (rodents and birds); offal; plant material (dates) all noted. No eggs noted with the exception of fish eggs.
Larus fuscus	0.166	0.166	0.166	0.166	0.166	0.17	0	Variable diet; fish; aquatic invertebrates; bird eggs; carrion and offal; rodents; and berries/plant material all noted to be important with variation again by location and season. No terrestrial invertebrates mentioned-portions otherwise divided equally among categories.
Larus glaucescens	0.2	0	0.2	0.2	0.2	0.2	0	Varied diet including fish; aquatic invertebrates; carrion/offall; bird eggs (particularly important in certain locations); small mammals. No terrestrial inverberates or plant material mentioned; so portions divided between remaining categories.
Larus glaucoides	0.2	0.1	0.1	0.5	0.1	0	0	Seeds and fruits sometimes important (=0.1); otherwise fish noted to be most important (=0.5); with eggs; bird chicks; and marine invertebrates noted to be secondary importance (0.2 to marine invertebrates with 0.1 given to eggs and to terrestrial vertebrates to capture important of chicks).
Larus heermanni	0	0	0.05	0.95	0	0	0.05	Fish mainly noted but only in breeding season= 0.90. Lizards and invertebrates also noted so 0.05 given to both terrestrial vertebrates and invertebrates

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Larus hyperboreus	0.14	0.144	0.144	0.144	0.144	0.144	0.14	Highly variable diet. Fish; marine invertebrates; terrestrial vertebrates (rodents; birds; bird young); eggs; terrestrial invertebrates; plant material (berries); and carrion/offal all noted. So divided equally among these seven categories.
Larus marinus	0.14	0.144	0.144	0.144	0.144	0.144	0.14	Also highly variable. Noted to eat fish; terrestrial vertebrates (mammals; adult and young birds); eggs; fruit and berries; marine invertebrates; insects; carrion/offal all noted too. Divided evenly between all categories
Larus schistisagus	0.425	0	0.025	0.425	0.05	0.05	0.025	Mainly fish and aquatic invertebrates noted so 0.425 to each carrion/offal; bird eggs(0.05 to each); and occasional mammals and insects noted (0.025 to each).
Leucophaeus atricilla	0.3	0	0	0.3	0.05	0.05	0.3	Both terrestrial (0.3)and aquatic invertebrates (0.3) noted to be important as well as fish (0.3)and carrion/offal/refuse in particular seasons (0.05). Eggs particularly important at certain sites (0.05)
Leucophaeus pipixcan	0.225	0.025	0.025	0.025	0	0	0.7	Small rodents and fish as well as plant material (grain or seeds) noted to be used very occasionally (0.025 to each). Otherwise noted to be predominantly terrestrial invertebrates with a smaller portion of aquatic invertebrates.
Limnodromus griseus	0.45	0.1	0	0	0	0	0.45	Plant material noted sometimes (=0.1); noted to feed on a mix of aquatic and terrestrial invertebrates with terrestrial being more important on breeding grounds; coastal times/places involve more aquatic invertebrates (0.45 to each).
Limnodromus scolopaceus	0.35	0.3	0	0	0	0	0.35	Terrestrial and aquatic invertebrates (0.35 each) and seeds all noted with plant material (0.3)noted to be less frequent.

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Limosa fedoa	0.5	0	0	0	0	0	0.5	Noted to be mainly insects (0.6) as well as aquatic invertebrates (0.4) such as crustaceans and leeches
Limosa haemastica	0.4	0.2	0	0	0	0	0.4	Plant material (tubers and seeds) noted in smaller quantities (0.2); but mainly terrestrial and aquatic invertebrates (0.4 to each)
Limosa lapponica	0.6	0.05	0	0.05	0	0	0.3	Occasionally seeds/berries/fruits (=0.05); small fish noted (=0.05); otherwise mainly aquatic invertebrates (=0.6) with a relatively fewer insects (=0.3) listed
Limosa limosa	0.35	0.3	0	0	0	0	0.35	Plant material noted to be particularly important in certain places and times (up to 100% of diet in some places). Otherwise terrestrial and aquatic invertebrates noted to be the main portion of diet.
Numenius phaeopus	0.425	0.1	0.025	0.025	0	0	0.425	Rarely fish and terrestrial vertebrates noted (=0.025 each). Berries; seeds; and leaves noted at particular timepoints (=0.01). Otherwise, diet noted to vary by coast/inland with inland individuals eating more terrestrial inverts and coastal individuals eating aquatic invertebrates.
Pagophila eburnea	0.25	0.25	0	0.25	0	0.25	0	Fish; aquatic invertebrates (shrimp); plant material (algae) and carrion/offal all noted in no particular abundances so divided equally among these 4.
Phalaropus lobatus	0.45	0.1	0	0	0	0	0.45	Some seeds noted (=0.1); otherwise list of aquatic and terrestrial vertebrates noted with variation in importance depending on time and place (0.45 to each).
Phalaropus tricolor	0.6	0.1	0	0	0	0	0.3	Some seeds noted (=0.1); but otherwise list of terrestrial and aquatic invertebrates such as flies and shrimp noted. Specific note that this is mostly aquatic invertebrates so slightly larger portion given to aquatic vs. terrestrial.

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Pluvialis dominica	0.475	0.05	0	0	0	0	0.475	Occasionally seeds and leaves are noted (=0.05); otherwise terrestrial and aquatic inverts are main food source listed; split equally between these two.
Pluvialis fulva	0.45	0.05	0	0	0	0	0.45	Vegetation and berries noted to be important to a small extent (=0.05); otherwise predominantly terrestrial and aquatic invertebrates; so split remaining portion evenly between these two categories.
Pluvialis squatarola	0.475	0.05	0	0	0	0	0.475	Noted to occasionally take grass and seeds (=0.05); otherwise noted to feed on both aquatic and terrestrial invertebrates; depending on season/location.
Recurvirostra americana	0.7	0.15	0	0	0	0	0.15	Noted to mainly feed on aquatic invertebrates (=0.7) but that diet will be extended in some areas to include seeds/vegetation (0.15) as well as terrestrial insects (0.15).
Rhodostethia rosea	0.33	0	0	0.33	0	0	0.34	Noted to have little info. Noted to be insectivorous during breeding but in migration to eat marine invertebrates and small fish. To account for seasonal differences; dividing portion amongst these three.
Rynchops niger	0.05	0	0	0.95	0	0	0	Noted to be mainly fish (=0.95) with a small amount of crustaceans (=.05).
Scolopax minor	0	0.05	0	0	0	0	0.95	Noted to eat almost entirely terrestrial invertebrates; with a small amount of plant material ”rarely” eaten with importance changing if conditions are poor.
Stercorarius longicaudus	0.05	0.05	0.75	0.05	0	0.05	0.05	Large portion (particularly in summer) known to be mammals; chicks/small birds. Other items noted when food is scarce and speculated to be included in winter diet- includes marine insects (0.05); fish, insects, scavenge, and berries.

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Stercorarius parasiticus	0	0.1	0.2	0.5	0.1	0	0.1	Diet is variable and relies on kleptoparasitism. Fish are noted to be particular key with terrestrial vertebrates less important relative to other species; although do note consumption of birds/chicks. Noted to also eat eggs (0.1); insects (0.1) and berries (0.1). When nesting close to other seabird colonies; will obtain most or all of food by kleptoparasitism; especially stealing fish from Arctic Terns; Black-legged kittiwake; Atlantic puffins; and black guillemots. In tundra habitats; microtine rodents are often not a major prey item; in contrast with S. pomarinus and S. longicaudus ; adult and fledgling passerines; wader chicks; birds eggs; insects and berries are all exploited. Present species appears to be less able to catch insects or to pounce onto lemmings than S. pomarinus. In winter and on migration; present species often associates with aggregations of terns or small gulls and feeds mainly by kleptoparasitism
Stercorarius pomarinus	0	0	0.8	0.67	0.66	0.66	0	Noted to be heavy consumers of terrestrial vertebrates; mostly lemmings and other birds (0.8)- also noted to take eggs; some carrion; and fish so remaining portion divided into these three categories.
Sterna dougallii	0.05	0	0	0.9	0	0	0.05	Noted to ”rarely” eat insects and marine invertebrates so 0.05 given to both categories; with most of diet coming from fish (=0.9).
Sterna forsteri	0.1	0	0	0.9	0	0	0	Mainly noted to be fish (=0.9) with a smaller portion of aquatic insects/crustaceans (=0.1).

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Sterna hirundo	0.067	0	0	0.8	0	0.066	0.067	Noted to mainly eat fish (=0.8); iwth some variation depending on time and place. Other food sources include aquatic invertebrates; terrestrial invertebrates; and offal.
Sterna paradisaea	0.25	0.05	0	0.6	0	0	0.1	Diverse diet. Small fish are key (=0.6); with other items less important but including aquatic invertebrates (=0.25); occasional berries (=0.05); and terrestrial insects when inland (=0.1).
Sternula antillarum	0.475	0	0	0.475	0	0	0.05	Fish and aquatic invertebrates are the main food sources; with terrestrial/flying insects noted to be taken ”occasionally” (=0.05).Small fish fry on breeding grounds. Also shrimps; marine worms; and occasionally flying ants and other insects
Thalasseus elegans	0	0	0	1	0	0	0	Only fish noted.
Thalasseus maximus	0.2	0	0	0.8	0	0	0	”Mainly” noted to take fish (0.8); with aquatic invertebrates (0.2) also included in list but of less importance.
Thalasseus sandvicensis	0.05	0	0	0.95	0	0	0	”Almost entirely” noted to be fish; with shrimp taken ”occasionally”.
Tringa flavipes	0.475	0	0	0.05	0	0	0.475	Small fish included in list as one of many elements (=0.05); otherwise takes predominantly terrestrial and aquatic insects (remaining portion divided between two categories).
Tringa glareola	0.6	0.1	0.05	0.05	0	0	0.2	Plant matter noted sometimes (=0.1); and occasional frogs (=0.05 for terrestrial vertebrates). Otherwise noted to chiefly take aquatic invertebrates especially in certain times and locations; with small fish (=0.05) and terrestrial insects noted in other locations (=02).

Species	AInv	Plt	Tvert	Fish	Egg	Crr	Tinv	Expl
Tringa melanoleuca	0.34	0	0	0.33	0	0	0.33	Terrestrial invertebrates; aquatic invertebrates; and fish all noted in no particular quanitities so divided portion between these three categories. Small crustaceans; fish ; worms; aquatic insects and their larvae; also terrestrial insects; such as small grasshoppers; ants and flies
Tringa semipalmata	0.75	0	0	0.25	0	0	0	Noted to take predominantly aquatic invertebrates (=0.75) with fish of lesser importance/limited to outside of breeding season.
Tringa solitaria	0.5	0	0	0.025	0	0	0.475	Small frogs noted occasionally (=0.025); otherwise aquatic and terrestrial an dterrestrial insects noted to be main food sources; so remaining portion divided almost equally between these two categories; with a slightly greater importance of aquatic invertebrates.
Vanellus vanellus	0	0	0	0	0	0	1	Nothing noted but terrestrial invertebrates.
Xema sabini	0.3	0.05	0.025	0.275	0.025	0.025	0.3	Eggs; small birds; and carrion noted in smaller quantities (=0.025 each). Otherwise noted to take smaller amounts of plant matter (=0.05); but predominantly terrestrial and aquatic invertebrates and small fish.
Xenus cinereus	0.34	0.33	0	0	0	0	0.33	Seeds; terrestrial invertebrates; and aquatic invertebrates all noted to be main food items with no particular importance mentioned; so portion divided evenly amongst three categories.

Summary of Charadriiform species estimated in the Midwest and East Coast

Below is information on the charadriiform species seen within the area analyzed, as based on aggregation of eBird status and trends abundances maps (Fink et al. 2021; see `https://ebird.org/science/status-and-trends`). The species, the maximum abundance seen in any grid cell within one four week window ('Maximum Abundance'), and the percentage of grid cells in which that species was seen in at any time point ('Percent Area Seen In') are given.

Table 10: 85 charadriform species seen across the Midwest and the East Coast of North America

Species	Maximum Abundance	Percent Area Seen In
Actitis macularius	1.316580415	98.22585187
Arenaria interpres	16.2467846	33.2863982
Bartramia longicauda	0.543699861	35.34215714
Calidris acuminata	0.002722888	1.154604337
Calidris alba	32.2518692	30.75190087
Calidris alpina	30.21470094	50.57730217
Calidris bairdii	1.263557136	45.62095184
Calidris canutus	9.458807707	17.68515911
Calidris ferruginea	0.000785613	0.366094058
Calidris fuscicollis	7.535565615	49.70430865
Calidris himantopus	2.351915926	41.0025345
Calidris maritima	9.534837246	9.687411997
Calidris mauri	0.182380859	3.85806815
Calidris melanotos	11.7942121	60.23655308
Calidris minutilla	7.079209208	62.48943959
Calidris pugnax	0.004791448	3.801745987
Calidris pusilla	175.6827488	55.95606871
Calidris ruficollis	5.65E-05	0.056322163
Calidris subruficollis	0.332338311	32.526049
Calidris virgata	0.000405998	0.028161081
Charadrius hiaticula	0.000970432	1.295409744
Charadrius melodus	0.8064612	12.36271473
Charadrius nivosus	0.046127661	0.337932977
Charadrius semipalmatus	23.91216826	56.29400169
Charadrius vociferus	17.49752021	82.5964517

Species	Maximum Abundance	Percent Area Seen In
Charadrius wilsonia	0.00367434	0.394255139
Chlidonias niger	1.804823697	42.77668262
Chroicocephalus philadelphia	150.2515869	57.73021684
Chroicocephalus ridibundus	0.325924322	2.140242185
Gallinago delicata	0.833263457	95.57871022
Gelochelidon nilotica	0.062731262	0.901154604
Haematopus palliatus	3.935701132	2.478175162
Himantopus mexicanus	0.809868664	11.29259364
Hydrocoloeus minutus	0.15404295	6.70233737
Hydroprogne caspia	26.32411146	31.96282737
Larus argentatus	235.085907	64.65784286
Larus californicus	0.008591222	1.126443255
Larus canus	0.001445965	0.337932977
Larus crassirostris	8.64E-05	0.19712757
Larus delawarensis	302.226738	78.3722895
Larus fuscus	1.699484825	23.68346945
Larus glaucescens	0.000394493	0.028161081
Larus glaucoides	6.084546566	19.71275697
Larus heermanni	0.000165353	0.028161081
Larus hyperboreus	2.826425076	19.45930724
Larus marinus	67.53624916	14.53111799
Larus schistisagus	0.008845784	3.548296255
Leucophaeus atricilla	91.64442635	6.167276823
Leucophaeus pipixcan	38.78853393	16.95297099
Limnodromus griseus	36.30611324	44.66347508
Limnodromus scolopaceus	2.884081081	33.68065334
Limosa fedoa	0.695881426	16.92480991
Limosa haemastica	0.393891476	24.19036891
Limosa lapponica	8.21E-05	0.19712757
Limosa limosa	0.000497637	0.535060546
Numenius phaeopus	2.788505256	15.85468882
Pagophila eburnea	0.001000179	0.112644326
Phalaropus lobatus	13.83479261	34.52548578
Phalaropus tricolor	1.40204601	33.37088144
Pluvialis dominica	31.51812553	55.05491411
Pluvialis fulva	0.004752611	0.19712757
Pluvialis squatarola	16.12001872	45.31117995
Recurvirostra americana	1.015233107	17.34722613
Rhodostethia rosea	0.004496066	0.506899465

Species	Maximum Abundance	Percent Area Seen In
Rynchops niger	3.959173679	1.492537313
Scolopax minor	0.762936339	98.90171783
Stercorarius longicaudus	0.014843466	1.323570825
Stercorarius parasiticus	0.635363802	12.92593636
Stercorarius pomarinus	0.188990196	6.336243312
Sterna dougallii	14.29290223	2.590819487
Sterna forsteri	3.59155786	20.61391157
Sterna hirundo	195.0851822	37.48239932
Sterna paradisaea	22.83648014	6.364404393
Sternula antillarum	13.76483774	4.646578429
Thalasseus elegans	3.36E-05	0.056322163
Thalasseus maximus	1.152461901	1.126443255
Thalasseus sandvicensis	0.001280522	0.225288651
Tringa flavipes	6.935514629	64.88313151
Tringa glareola	0.000336967	0.056322163
Tringa melanoleuca	2.394188344	80.73782033
Tringa semipalmata	3.889367342	19.17769642
Tringa solitaria	0.407473348	97.74711349
Vanellus vanellus	0.004840602	0.140805407
Xema sabini	0.055361058	4.196001126
Xenus cinereus	1.72E-05	0.028161081

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