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DATA PAPER

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SNAPSHOT USA 2020: A second coordinated national camera trap survey of the United States during the COVID-19 pandemic

Roland Kays[1,2] | Michael V. Cove[2] | Jose Diaz[3] | Kimberly Todd[3] | Claire Bresnan[3] | Matt Snider[1] | Thomas E. Lee Jr[4] | Jonathan G. Jasper[4] | Brianna Douglas[4] | Anthony P. Crupi[5] | Katherine C. B. Weiss[6,7] | Helen Rowe[8] | Tiffany Sprague[8] | Jan Schipper[7] | Christopher A. Lepczyk[9] | Jean E. Fantle-Lepczyk[9] | Jon Davenport[10] | Marketa Zimova[10] | Zach Farris[11] | Jacque Williamson[12] | M. Caitlin Fisher-Reid[13] | Drew Rezendes[13] | Sean M. King[13] | Petros Chrysafis[14] | Alex J. Jensen[15] | David S. Jachowski[15] | Katherine C. King[16] | Daniel J. Herrera[17] | Sophie Moore[17] | Marius van der Merwe[18] | Jason V. Lombardi[19] | Maksim Sergeyev[19] | Michael E. Tewes[19] | Robert V. Horan III[20] | Michael S. Rentz[21] | Ace Driver[21] | La Roy S. E. Brandt[22] | Christopher Nagy[23] | Peter Alexander[24] | Sean P. Maher[25] | Andrea K. Darracq[26] | Evan G. Barr[26] | George Hess[3] | Stephen L. Webb[27] | Mike D. Proctor[27] | John P. Vanek[28] | Diana J. R. Lafferty[29] | Tru Hubbard[29] | Jaime E. Jiménez[30] | Craig McCain[30] | Jorie Favreau[31] | Jack Fogarty[31] | Jacob Hill[32] | Steven Hammerich[33] | Morgan Gray[33] | Christine C. Rega-Brodsky[34] | Caleb Durbin[34] | Elizabeth A. Flaherty[35] | Jarred Brooke[35] | Stephanie S. Coster[36] | Richard G. Lathrop[37] | Katarina Russell[37] | Daniel A. Bogan[38] | Hila Shamon[39] | Brigit Rooney[40] | Aimee Rockhill[41] | Robert C. Lonsinger[42] | M. Teague O'Mara[43] | Justin A. Compton[44] | Erika L. Barthelmess[45] | Katherine E. Andy[45] | Jerrold L. Belant[46] | Tyler Petroelje[46] | Nathaniel H. Wehr[46] | Dean E. Beyer Jr[47] | Daniel G. Scognamillo[48] | Chris Schalk[48] | Kara Day[49] | Caroline N. Ellison[50] | Chip Ruthven[50] | Blaine Nunley[50] | Sarah Fritts[51] | Christopher A. Whittier[52] | Sean A. Neiswenter[53] | Robert Pelletier[53] | Brett A. DeGregorio[54] | Erin K. Kuprewicz[55] | Miranda L. Davis[55] | Carolina Baruzzi[56] | Marcus A. Lashley[57] | Brandon McDonald[16,57] | David Mason[57] | Derek R. Risch[58] | Maximilian L. Allen[59,60] | Laura S. Whipple[60] | Jinelle H. Sperry[60,61] | Emmarie Alexander[60] |

Patrick J. Wolff[61] | Robert H. Hagen[62] | Alessio Mortelliti[63] |
Amay Bolinjcar[63] | Andrew M. Wilson[64] | Scott Van Norman[65] |
Cailey Powell[65] | Henry Coletto[66] | Martha Schauss[66] | Helen Bontrager[67] |
James Beasley[67] | Susan N. Ellis-Felege[68] | Samuel R. Wehr[69] |
Sean T. Giery[70] | Charles E. Pekins[71] | Summer H. LaRose[72] |
Ronald S. Revord[72] | Christopher P. Hansen[73] | Lonnie Hansen[73] |
Joshua J. Millspaugh[73] | Adam Zorn[74] | Brian D. Gerber[75] |
Kylie Rezendes[75] | Jessie Adley[75] | Jennifer Sevin[76] | Austin M. Green[77] |
Çağan H. Şekercioğlu[77,78] | Mary E. Pendergast[79] | Kayleigh Mullen[80] |
Tori Bird[80] | Andrew J. Edelman[81] | Andrea Romero[82] | Brian J. O'Neill[83] |
Noel Schmitz[83] | Rebecca A. Vandermus[82] | Jesse M. Alston[84] |
Kellie M. Kuhn[85] | Steven C. Hasstedt[85] | Damon B. Lesmeister[86] |
Cara L. Appel[87] | Christopher Rota[88] | Jennifer L. Stenglein[89] |
Christine Anhalt-Depies[89] | Carrie L. Nelson[90] | Robert A. Long[91] |
Kathryn R. Remine[91] | Mark J. Jordan[92] | L. Mark Elbroch[93] |
Dylan Bergman[94] | Sara Cendejas-Zarelli[95] | Kim Sager-Fradkin[95] |
Mike Conner[96] | Gail Morris[96] | Elizabeth Parsons[96] |
Haydée Hernández-Yáñez[3] | William J. McShea[3]

[1]Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, North Carolina, USA

[2]North Carolina Museum of Natural Sciences, Raleigh, North Carolina, USA

[3]Smithsonian Conservation Biology Institute, Front Royal, Virginia, USA

[4]Department of Biology, Abilene Christian University, Abilene, Texas, USA

[5]Alaska Department of Fish and Game, Division of Wildlife Conservation, Douglas, Alaska, USA

[6]Arizona State University, Tempe, Arizona, USA

[7]Field Conservation Research Department, Arizona Center for Nature Conservation/Phoenix Zoo, Phoenix, Arizona, USA

[8]McDowell Sonoran Conservancy, Scottsdale, Arizona, USA

[9]School of Forestry and Wildlife Sciences, Auburn University, Auburn, Alabama, USA

[10]Department of Biology, Appalachian State University, Boone, North Carolina, USA

[11]Department of Health and Exercise Science, Appalachian State University, Boone, North Carolina, USA

[12]Department of Education & Conservation, Brandywine Zoo-Delaware State Parks, Wilmington, Delaware, USA

[13]Department of Biological Sciences, Bridgewater State University, Bridgewater, Massachusetts, USA

[14]Predator Detection and Deterrence, Fresno, California, USA

[15]Department of Forestry and Environmental Conservation, Clemson University, Clemson, South Carolina, USA

[16]Crocodile Lake National Wildlife Refuge, Key Largo, Florida, USA

[17]DC Cat Count at the Humane Rescue Alliance, Washington, District of Columbia, USA

[18]Biological Sciences Department, Dixie State University, St. George, Utah, USA

[19]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, Texas, USA

[20]Georgia Department of Natural Resources, Wildlife Resources Division, Brunswick, Georgia, USA

[21]Natural Resource Ecology and Management, Iowa State University, Ames, Iowa, USA

[22]Cumberland Mountain Research Center, Lincoln Memorial University, Harrogate, Tennessee, USA

[23]Mianus River Gorge, Bedford, New York, USA

[24]Craighead Beringia South, Kelly, Wyoming, USA

[25]Department of Biology, Missouri State University, Springfield, Missouri, USA

[26]Department of Biology, Murray State University, Murray, Kentucky, USA

[27]Noble Research Institute, Ardmore, Oklahoma, USA

[28]Department of Biological Sciences, Northern Illinois University, DeKalb, Illinois, USA

[29]Wildlife Ecology and Conservation Science Lab, Department of Biology, Northern Michigan University, Marqeutte, Michigan, USA

[30]Department of Biological Sciences and the Advanced Environmental Research Institute, University of North Texas, Denton, Texas, USA

[31]Paul Smith's College, Paul Smiths, New York, USA

[32]Department Biology, North Carolina State University, Raleigh, North Carolina, USA

[33]Pepperwood Foundation, Santa Rosa, California, USA

[34]Biology Department, Pittsburg State University, Pittsburg, Kansas, USA

[35]Department of Forestry and Natural Resources, Purdue University, West Lafayette, Indiana, USA

[36]Biology Department, Randolph-Macon College, Ashland, Virginia, USA

[37]Department of Ecology, Evolution, and Natural Resources, Rutgers University, New Brunswick, New Jersey, USA

[38]Department of Environmental Studies and Sciences, Siena College, Loudonville, New York, USA

[39]Silvio O Conte National Fish and Wildlife Refuge, Brunswick, Vermont, USA

[40]Independent Researcher, Whitefish, Montana, USA

[41]Department of Geosciences and Natural Resources, Western Carolina University, Cullowhee, North Carolina, USA

[42]U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, Oklahoma, USA

[43]Department of Biological Sciences, Southeastern Louisiana University, Hammond, Louisiana, USA

[44]Biology and Chemistry Department, Springfield College, Springfield, Massachusetts, USA

[45]Biology Department and Nature Up North Program, St. Lawrence University, Canton, New York, USA

[46]Global Wildlife Conservation Center, State University of New York College of Environmental Science and Forestry, Syracuse, New York, USA

[47]Wildlife Division, Michigan Department of Natural Resources, Lansing, Michigan, USA

[48]Arthur Temple College of Forestry and Agriculture – Stephen F. Austin State University, Nacogdoches, Texas, USA

[49]Georgia Department of Natural Resources, Social Circle, Georgia, USA

[50]Texas Parks and Wildlife Department, Paducah, Texas, USA

[51]Department of Biology, Texas State University, San Marcos, Texas, USA

[52]Tufts Center for Conservation Medicine, Cummings School of Veterinary Medicine at Tufts University, North Grafton, Massachusetts, USA

[53]School of Life Sciences, University of Nevada, Las Vegas, Las Vegas, Nevada, USA

[54]U.S. Geological Survey Fish and Wildlife Cooperative Research Unit, University of Arkansas, Fayetteville, Arkansas, USA

[55]Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut, USA

[56]School of Forest, Fisheries, & Geomatics Sciences, University of Florida, Gainesville, Florida, USA

[57]Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, Florida, USA

[58]Department of Natural Resources and Environmental Management, University of Hawaii at Mānoa, Honolulu, Hawaii, USA

[59]Illinois Natural History Survey, University of Illinois, Champaign, Illinois, USA

[60]Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign, Urbana, Illinois, USA

[61]Engineer Research and Development Center, Champaign, Illinois, USA

[62]Environmental Studies Program, University of Kansas, Lawrence, Kansas, USA

[63]Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, Maine, USA

[64]Environmental Studies, Gettysburg College, Gettysburg, Pennsylvania, USA

[65]Cow Creek Band of Umpqua Tribe of Indians, Roseburg, Oregon, USA

[66]Friends of Cañada de los Osos Ecological Reserve, Gilroy, California, USA

[67]Savannah River Ecology Laboratory, D. B. Warnell School of Forestry and Natural Resources, University of Georgia, Aiken, South Carolina, USA

[68]Biology Department, University of North Dakota, Grand Forks, North Dakota, USA

[69]Department of Biology, Oberlin College, Oberlin, Ohio, USA

[70]Eberly College of Science, Department of Biology, The Pennsylvania State University, University Park, Pennsylvania, USA

[71]Fort Hood Natural Resources Management Branch, USA Army Garrison, Fort Hood, Texas, USA

[72]Center for Agroforestry, University of Missouri, Columbia, Missouri, USA

[73]Wildlife Biology Program, W.A. Franke College of Forestry and Conservation, University of Montana, Missoula, Montana, USA

[74]Huston-Brumbaugh Nature Center, University of Mount Union, Alliance, Ohio, USA

[75]Department of Natural Resources Science, University of Rhode Island, Kingston, Rhode Island, USA

[76]Department of Biology, University of Richmond, Richmond, Virginia, USA

[77]School of Biological Sciences, University of Utah, Salt Lake City, Utah, USA

[78]College of Sciences, Koç University, Rumelifeneri, İstanbul, Turkey

[79]Sageland Collaborative, Salt Lake City, Utah, USA

[80]Utah's Hogle Zoo, Salt Lake City, Utah, USA

[81]Department of Biology, University of West Georgia, Carrollton, Georgia, USA

[82]Department of Biological Sciences; Department of Geography, Geology, and Environmental Science, University of Wisconsin-Whitewater, Whitewater, Wisconsin, USA

[83]Department of Biological Sciences, University of Wisconsin-Whitewater, Whitewater, Wisconsin, USA

[84]Program in Ecology, Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming, USA

[85]Department of Biology, US Air Force Academy, USAFA, Colorado Springs, Colorado, USA

[86]USDA Forest Service, Pacific Northwest Research Station, Portland, Oregon, USA

[87]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, Oregon, USA

[88]Division of Forestry and Natural Resources, West Virginia University, Morgantown, West Virginia, USA

[89]Office of Applied Science, Wisconsin Department of Natural Resources, Madison, Wisconsin, USA

[90]U.S. Forest Service, Chequamegon-Nicolet National Forest, Great Divide Ranger District, Hayward, Wisconsin, USA

[91]Woodland Park Zoo, Seattle, Washington, USA

[92]Department of Biology, Seattle University, Seattle, Washington, USA

[93]Panthera, New York, New York, USA

[94]Point No Point Treaty Council, Poulsbo, Washington, USA

[95]Natural Resources, Lower Elwha Tribe, Port Angeles, Washington, USA

[96]The Jones Center at Ichauway, Newton, Georgia, USA

Correspondence
Roland Kays
Email: rwkays@ncsu.edu

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American Society for the Prevention of Cruelty to Animals, The Humane Society of the United States, Winn Feline Foundation, Maddie's Fund; Aurora Country Club; Iowa; Isabel Lepczyk, Kreher Preserve, and Nature Center; AK; Maine Department of Inland Fisheries; Mcnair's Scholars Program; Murray State University; National Science Foundation; Ordway-Swisher Biological Station; Pepperwood Foundation; Scout Island Educational Center; Smithsonian Institution; The Delaware Zoological Society, Parks, DE State, Brandywine Zoo; U.S. Department of Agriculture; U.S. Department of Energy, Grant/Award Number: DE-EM0004391; University of Kansas Field Station, KU Environmental

Abstract

Managing wildlife populations in the face of global change requires regular data on the abundance and distribution of wild animals, but acquiring these over appropriate spatial scales in a sustainable way has proven challenging. Here we present the data from Snapshot USA 2020, a second annual national mammal survey of the USA. This project involved 152 scientists setting camera traps in a standardized protocol at 1485 locations across 103 arrays in 43 states for a total of 52,710 trap-nights of survey effort. Most (58) of these arrays were also sampled during the same months (September and October) in 2019, providing a direct comparison of animal populations in 2 years that includes data from both during and before the COVID-19 pandemic. All data were managed by the eMammal system, with all species identifications checked by at least two reviewers. In total, we recorded 117,415 detections of 78 species of wild mammals, 9236 detections of at least 43 species of birds, 15,851 detections of six domestic animals and 23,825 detections of humans or their vehicles. Spatial differences across arrays explained more variation in

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the relative abundance than temporal variation across years for all 38 species modeled, although there are examples of significant site-level differences among years for many species. Temporal results show how species allocate their time and can be used to study species interactions, including between humans and wildlife. These data provide a snapshot of the mammal community of the USA for 2020 and will be useful for exploring the drivers of spatial and temporal changes in relative abundance and distribution, and the impacts of species interactions on daily activity patterns. There are no copyright restrictions, and please cite this paper when using these data, or a subset of these data, for publication.

KEYWORDS

biodiversity, biogeography, camera traps, Carnivora, Cetartiodactyla, Didelphimorphia, Lagomorpha, mammals, occupancy modeling, species distribution modeling

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The complete data set is available as Supporting Information (Data S1). Associated data are also available at the Smithsonian's eMammal data repository https://emammal.si.edu/analysis/data-download by choosing North America in the map and then selecting the project: Snapshot USA – 2020.

ORCID

Roland Kays https://orcid.org/0000-0002-2947-6665
Michael V. Cove https://orcid.org/0000-0001-5691-0634
Christopher A. Lepczyk https://orcid.org/0000-0002-5316-3159
Marketa Zimova https://orcid.org/0000-0002-8264-9879
Zach Farris https://orcid.org/0000-0003-0600-9682
M. Caitlin Fisher-Reid https://orcid.org/0000-0003-1587-7086
Sophie Moore https://orcid.org/0000-0001-7359-7109
Stephen L. Webb https://orcid.org/0000-0001-6034-5164
John P. Vanek https://orcid.org/0000-0002-8684-9632
Christine C. Rega-Brodsky https://orcid.org/0000-0002-3483-1465
Hila Shamon https://orcid.org/0000-0001-5252-7013
Robert C. Lonsinger https://orcid.org/0000-0002-1040-7299
M. Teague O'Mara https://orcid.org/0000-0002-6951-1648
Tyler Petroelje https://orcid.org/0000-0003-4957-6732
Erin K. Kuprewicz https://orcid.org/0000-0002-6658-9052
Carolina Baruzzi https://orcid.org/0000-0003-1796-9355
Marcus A. Lashley https://orcid.org/0000-0002-1086-7754
David Mason https://orcid.org/0000-0001-8456-5700
Maximilian L. Allen https://orcid.org/0000-0001-8976-889X
Alessio Mortelliti https://orcid.org/0000-0003-0480-6100
Helen Bontrager https://orcid.org/0000-0002-9457-2119
James Beasley https://orcid.org/0000-0001-9707-3713
Sean T. Giery https://orcid.org/0000-0003-3774-5295
Brian D. Gerber https://orcid.org/0000-0001-9285-9784
Austin M. Green https://orcid.org/0000-0002-7443-3015
Jesse M. Alston https://orcid.org/0000-0001-5309-7625
Damon B. Lesmeister https://orcid.org/0000-0003-1102-0122
Cara L. Appel https://orcid.org/0000-0002-4761-606X

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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Roland Kays[1,2], Michael V. Cove[2], Jose Diaz[3], Kimberly Todd[3], Claire Bresnan[3], Matt Snider[1],Thomas E. Lee, Jr.[4], Jonathan G. Jasper[4], Brianna Douglas[4], Anthony P. Crupi[5], Katherine C.B. Weiss[6,7], Helen Rowe[8], Tiffany Sprague[8], Jan Schipper[7], Christopher A. Lepczyk[9], Jean E. Fantle-Lepczyk[9], Jon Davenport[10], Marketa Zimova[10], Zach Farris[11], Jacque Williamson[12], M. Caitlin Fisher-Reid[13], Drew Rezendes[13], Sean M. King[13], Petros Chrysafis[14], Alex J. Jensen[15], David S. Jachowski[15], Katherine C. King[16], Daniel J. Herrera[17], Sophie Moore[17], Marius van der Merwe[18], Jason V. Lombardi[19], Maksim Sergeyev[19], Michael E. Tewes[19], Robert V. Horan III[20], Michael S. Rentz[21], Ace Driver[21], LaRoy S.E. Brandt[22], Christopher Nagy[23], Peter Alexander[24],Sean P. Maher[25], Andrea K. Darracq[26], Evan G. Barr[26], George Hess[3], Stephen L. Webb[27], Mike D. Proctor[27], John P. Vanek[28], Diana J. R. Lafferty[29], Tru Hubbard[29], Jaime E. Jiménez[30], Craig McCain[30], Jorie Favreau[31], Jack Fogarty[31], Jacob Hill[32], Steven Hammerich[33], Morgan Gray[33], Christine C. Rega-Brodsky[34], Caleb Durbin[34], Elizabeth A. Flaherty[35], Jarred Brooke[35], Stephanie S. Coster[36], Richard G. Lathrop[37], Katarina Russell[37], Daniel A. Bogan[38], Hila Shamon[3], Brigit Rooney[40], Aimee Rockhill[41], Robert C. Lonsinger[42], M. Teague O'Mara[43], Justin A. Compton[44], Erika L. Barthelmess[45], Katherine E. Andy[45], Jerrold L. Belant[46], Tyler Petroelje[46], Nathaniel H. Wehr[46], Dean E. Beyer, Jr.[47], Daniel G. Scognamillo[48], Chris Schalk[48], Kara Day[49], Caroline N. Ellison[50], Chip Ruthven[50], Blaine Nunley[50], Sarah Fritts[51], Christopher A. Whittier[52], Sean A. Neiswenter[53], Robert Pelletier[53], Brett A. DeGregorio[54], Erin K. Kuprewicz[55], Miranda L. Davis[55], Carolina Baruzzi[57], Marcus A. Lashley[56], Brandon McDonald[16,56], David Mason[56], Derek R. Risch[58], Maximilian L. Allen[59,60],

Laura S. Whipple[60], Jinelle H. Sperry[60,61], Emmarie Alexander[60], Patrick J. Wolff[61], Robert H. Hagen[62], Alessio Mortelliti[63], Amay Bolinjcar[63], Andrew M. Wilson[64], Scott Van Norman[65], Cailey Powell[65], Henry Coletto[66], Martha Schauss[66], Helen Bontrager[67], James Beasley[67], Susan N. Ellis-Felege[68], Samuel R. Wehr[69], Sean T. Giery[70], Charles E. Pekins[71], Summer H. LaRose[72], Ronald S. Revord[72], Christopher P. Hansen[73], Lonnie Hansen[73], Joshua J. Millspaugh[73], Adam Zorn[74], Brian D. Gerber[75], Kylie Rezendes[75], Jessie Adley[75], Jennifer Sevin[76], Austin M. Green[77], Çağan H. Şekercioğlu[77,78], Mary E. Pendergast[79], Kayleigh Mullen[80], Tori Bird[80], Andrew J. Edelman[81], Andrea Romero[82], Brian J. O'Neill[83], Noel Schmitz[83], Rebecca A Vandermus[82], Jesse M. Alston[84], Kellie M. Kuhn[85], Steven C. Hasstedt[85], Damon B. Lesmeister[86], Cara L. Appel[87], Christopher Rota[88], Jennifer L. Stenglein[89], Christine Anhalt-Depies[89], Carrie L. Nelson[90], Robert A. Long[91], Kathryn R. Remine[91], Mark J. Jordan[92], L. Mark Elbroch[93], Dylan Bergman[94], Sara Cendejas-Zarelli[95], Kimberly Sager-Fradkin[95], Mike Conner[96], Gail Morris[96], Elizabeth Parsons[96], Haydée Hernández-Yáñez[3], William J. McShea[3]

[1] Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27607

[2] North Carolina Museum of Natural Sciences, Raleigh, NC 27601

[3] Smithsonian Conservation Biology Institute, Front Royal, VA 22630

[4]Department of Biology, Abilene Christian University, Abilene, TX 79601

[5]Alaska Department of Fish and Game, Division of Wildlife Conservation, Douglas, AK 99824

[6]Arizona State University, Tempe, AZ 85281

[7]Field Conservation Research Department, Arizona Center for Nature Conservation/Phoenix Zoo, 455 N Galvin Pkwy, Phoenix, AZ 85008

[8]McDowell Sonoran Conservancy, 7729 East Greenway Road, Suite 100, Scottsdale, AZ 85260

[9]School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL 36849

[10] Department of Biology, Appalachian State University, 572 Rivers Street, ASU Box 32027, Boone NC 28608

[11]Department of Health & Exercise Science, Appalachian State University, 1179 State Farm Rd., Boone, NC 28608

[12]Department of Education & Conservation, Brandywine Zoo-Delaware State Parks, Wilmington, Delaware, 19802

[13]Department of Biological Sciences, Bridgewater State University, Bridgewater, MA 02325

[14]Predator Detection and Deterrence, Fresno, CA 93740

[15]Department of Forestry and Environmental Conservation, Clemson University, Clemson, SC 29631

[16]Crocodile Lake National Wildlife Refuge, Key Largo, FL 33037

[17]DC Cat Count at the Humane Rescue Alliance, Washington, DC 20011

[18]Biological Sciences Department, Dixie State University, St. George, UT 84770

[19]Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, Texas, 78363

[20]Georgia Department of Natural Resources, Wildlife Resources Division, Brunswick, GA 31520

[21]Natural Resource Ecology and Management, Iowa State University, Ames, IA 50011

[22]Cumberland Mountain Research Center, Lincoln Memorial University, Harrogate, TN 37752

[23]Mianus River Gorge, Bedford, NY 10506

[24]Craighead Beringia South, Kelly, WY 83011

[25]Department of Biology, Missouri State University, Springfield, MO 65897

[26]Department of Biology, Murray State University, Murray, KY 42071

[27]Noble Research Institute, LLC, 2510 Sam Noble Parkway, Ardmore, OK 73401

[28]Department of Biological Sciences, Northern Illinois University, DeKalb, Illinois 60115

[29]Wildlife Ecology and Conservation Science Lab, Department of Biology, Northern Michigan University, Marqeutte, MI 49855

[30] Department of Biological Sciences and the Advanced Environmental Research Institute, University of North Texas, Denton, TX, USA.

[31]Paul Smith's College, Paul Smiths, NY 12970

[32] Department Biology, North Carolina State University, Raleigh, NC 27607

[33]Pepperwood Foundation, 2130 Pepperwood Preserve Rd, Santa Rosa, CA 95404

[34]Biology Department, Pittsburg State University, 1701 S Broadway, Pittsburg, KS 66762

[35]Department of Forestry and Natural Resources, Purdue University, West Lafayette, IN 47907

[36]Biology Department, Randolph-Macon College, Ashland, VA 23005

[37]Department of Ecology, Evolution, and Natural Resources, Rutgers University, New Brunswick, NJ 08901

[38]Department of Environmental Studies and Sciences, Siena College, 515 Loudon Rd, Loudonville, NY 12211

[39]Silvio O Conte National Fish and Wildlife Refuge, Brunswick, VT 05905

[40]Whitefish, MT 59937

[41] Department of Geosciences and Natural Resources, Western Carolina University, Cullowhee, NC, 28723

[42]U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University, Stillwater, OK 74078

[43]Department of Biological Sciences, Southeastern Louisiana University, 808 N Pine St., Hammond, Louisiana 70402

[44]Biology and Chemistry Department, Springfield College, Springfield, MA 01109

[45]Biology Department and Nature Up North Program, St. Lawrence University, Canton, New York 13617

[46]Global Wildlife Conservation Center, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210

[47]Wildlife Division, Michigan Department of Natural Resources, Lansing, MI 48909

[48]Arthur Temple College of Forestry and Agriculture - Stephen F. Austin State University, Nacogdoches, TX 75962

[49] Georgia Department of Natural Resources, Social Circle, GA 30025

[50]Texas Parks and Wildlife Department, Paducah, TX 79248

[51]Department of Biology, Texas State University, San Marcos, TX 78666

[52]Tufts Center for Conservation Medicine, Cummings School of Veterinary Medicine at Tufts University, North Grafton, MA 01536

[53]School of Life Sciences, University of Nevada, Las Vegas, 4505 Maryland Parkway, MS4004, Las Vegas, NV 89154

[54]U.S. Geological Survey Fish and Wildlife Cooperative Research Unit, University of Arkansas, Fayetteville, AR 72701

[55]Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT 06269

[56]Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL 32611

[57]School of Forest Resources and Conservation, University of Florida, Gainesville, FL 32611

[58]Department of Natural Resources and Environmental Management, University of Hawaii at Mānoa, Honolulu, HI 96822

[59]Illinois Natural History Survey, University of Illinois, 1816 S. Oak Street, Champaign, IL 61820

[60]Department of Natural Resources and Environmental Sciences, University of Illinois Urbana-Champaign, 1102 S Goodwin Ave, Urbana IL 61801

[61]Engineer Research and Development Center, 2902 Newmark Dr., Champaign IL 61826

[62]Environmental Studies Program, University of Kansas, Lawrence KS 66045

[63]Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, 5755 Nutting Hall, Orono, ME 04469

[64] Environmental Studies, Gettysburg College, Gettysburg, PA 17325

[65] Cow Creek Band of Umpqua Tribe of Indians, Roseburg, OR 97470

[66] Friends of Cañada de los Osos Ecological Reserve, Gilroy, CA, 95020

[67] University of Georgia, Savannah River Ecology Laboratory, D.B. Warnell School of Forestry and Natural Resources, P.O. Drawer E, Aiken, SC 29802, USA

[68] Biology Department, University of North Dakota, Grand Forks, ND 58202, USA

[69] Department of Biology, Oberlin College, Oberlin, OH 44074

[70]Eberly College of Science, Department of Biology, The Pennsylvania State University, PA 16802

[71] Fort Hood Natural Resources Management Branch, United States Army Garrison, 1939 Rod & Gun Club Loop, Fort Hood, TX 76544

[72]Center for Agroforestry, University of Missouri, 302 Anheuser-Busch Natural Resources Building, Columbia, MO 65211

[73]Wildlife Biology Program, W.A. Franke College of Forestry and Conservation, University of Montana, Missoula, MT 59812

[74]Huston-Brumbaugh Nature Center, University of Mount Union, Alliance, OH 44601

[75]Department of Natural Resources Science, University of Rhode Island, Kingston, RI 02881

[76]Department of Biology, University of Richmond, Richmond, VA 23173

[77]School of Biological Sciences, University of Utah, Salt Lake City, UT 84112

[78]College of Sciences, Koç University, Rumelifeneri, İstanbul, Sarıyer, Turkey

[79]Sageland Collaborative, Salt Lake City, UT

[80]Utah's Hogle Zoo, Salt Lake City, Utah.

[81]Department of Biology, University of West Georgia, Carrollton, GA 30118

[82]Department of Biological Sciences; Department of Geography, Geology, and Environmental Science, University of Wisconsin-Whitewater, Whitewater, WI 53190

[83]Department of Biological Sciences, University of Wisconsin-Whitewater, Whitewater, Wisconsin, 53190 USA

[84]Program in Ecology, Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming, 82071

[85]Deparment of Biology, US Air Force Academy, USAFA, CO 80840

[86]USDA Forest Service, Pacific Northwest Research Station, Portland, OR 97204

[87]Department of Fisheries, Wildlife, and Conservation Sciences, Oregon State University, Corvallis, OR 97331

[88]Division of Forestry and Natural Resources, West Virginia University, Morgantown, WV 26506

[89]Office of Applied Science, Wisconsin Department of Natural Resources, Madison, WI 53716

[90]U.S. Forest Service, Chequamegon-Nicolet National Forest, Great Divide Ranger District, Hayward, WI 54843

[91]Woodland Park Zoo, Seattle, WA 98103

[92]Department of Biology, Seattle University, Seattle, WA 98122

[93] Panthera, 8 West 40th Street, 18th floor, New York, NY 10018

[94] Point No Point Treaty Council, 19472 Powder Hill Pl NE, Poulsbo, WA 98370

[95] Natural Resources, Lower Elwha Tribe, 760 Stratton Road, Port Angeles, WA 98363

[96] The Jones Center at Ichauway, Newton, GA 39870.

* Correspondence and requests for materials should be addressed to Roland Kays (email: rwkays@ncsu.edu).

Abstract: Managing wildlife populations in the face of global change requires regular data on the abundance and distribution of wild animals but acquiring these over appropriate spatial scales in a sustainable way has proven challenging. Here we present the data from Snapshot USA 2020, a second annual national mammal survey of the United States of America. This project involved 152 scientists setting camera traps in a standardized protocol at 1485 locations across 103 arrays in 43 states for a total of 52,710 trap-nights of survey effort. Most (58) of these arrays were also sampled during the same months (September and October) in 2019, providing a direct comparison of animal populations in two years that include data from both during and before the COVID-19 pandemic. All data were managed by the eMammal system, with all species identifications checked by at least two reviewers. In total we recorded 117,415 detections of 78 species of wild mammals, 9236 detections of at least 43 species of birds, 15,851 detections of six domestic animals and 23,825 detections of humans or their vehicles. Spatial differences across arrays explained more variation in the relative abundance than temporal variation across years for all 38 species modeled, although there are examples of significant site-level differences between years for many species. Temporal results show how species allocate their time and can be used to study species interactions, including between humans and wildlife. These data provide a snapshot of the mammal community of the USA for 2020 and will be useful for exploring the drivers of spatial and temporal changes in relative abundance and distribution, and the impacts of species interactions on daily activity patterns. There are no copyright restrictions, and please cite this paper when using these data, or a subset of these data, for publication.

Key words: Biodiversity, biogeography, camera traps, Carnivora, Cetartiodactyla, Cingulata, Didelphimorphia, Lagomorpha, mammals, occupancy modeling, Rodentia, species distribution modeling.

METADATA

Introduction

Long-term measurements of climate and land use have documented the rapid pace of change on the planet but tracking the response of biodiversity to these changes has been more difficult (Brondizio et al. 2019, Shukla et al. 2019). While distributed networks of weather sensors and remote sensing from satellites have proven sustainable models for monitoring climate and land use at large scales over many years, there are far fewer such schemes for biodiversity. Citizen science approaches offer potential solutions for some taxa, although there are still problems of nonstandard sampling, and there are many species that avoid humans, and thus are not easily recorded by volunteers (Rosenberg et al. 2019, Di Cecco et al. 2021). Sensor-based measures of biodiversity offer the potential for a more standardized protocol, analogous to distributed weather stations, but deploying them at large scales creates new logistical, equipment, and data challenges (Lasky et al. 2021). Here we present a second year of data from a coordinated camera trap survey of the United States (*sensu* Cove et al. 2021, see also the Snapshot Safari network in Africa Pardo et al. 2021). Our collaboration model involves scientists, and their students, and community volunteers, setting their own camera traps in an array near their home institutions and sharing the data through a common data platform (eMammal, McShea et al. 2016). The data are published annually with all collaborators as coauthors and are useful for studying the drivers of spatial patterns of species abundance and distribution, as well as changes over time. Please cite this paper when using the 2020 data in publications.

Class I. Data set descriptors

A. Data set identity: Camera trap data of mammals and terrestrial birds from a coordinated survey of the USA.

Title: SNAPSHOT USA 2020: a second coordinated national camera trap survey of the United States during the COVID-19 pandemic

B. Data set and metadata identification codes:

Suggested Data Set Identity Codes:

SNAPSHOT_USA_2020_observations.csv;

SNAPSHOT_USA_2020_deployments.csv

C. Data set description:

1. Principal investigator:

Roland Kays, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, NC 27695, USA and North Carolina Museum of Natural Sciences, Raleigh, NC 27601, USA;

Michael V. Cove, North Carolina Museum of Natural Sciences, Raleigh, NC 27601, USA;

William J. McShea, Smithsonian Conservation Biology Institute, Front Royal, VA, 22630, USA

2. Abstract: Same as above.

D. Keywords: Biodiversity, biogeography, camera traps, Carnivora, Cetartiodactyla, Cingulata, Didelphimorphia, Lagomorpha, mammals, occupancy modeling, Rodentia, species distribution modeling.

E. Description

The SNAPSHOT USA database includes camera trap observations from 1485 camera trap sites across 103 camera trap arrays (non-independent camera clusters, Table 1) from 43 U.S. states deployed from 14 July 2020 through 3 December 2020 (95% of data come from

September and October 2020). The number of camera trap sites within each array varied and was dependent on logistics, and equipment, such that arrays ranged from 5-65 camera locations with a mean of 14.4 locations producing an average of 512 camera-nights of survey effort per array (range 65-2354). Within an array, cameras were spaced greater than 200m but not more than 5km apart. This design was indented to accommodate a variety of array sizes, recognizing that spatial autocorrelation is not typically high in camera trapping data (Kays et al. 2021, Kolowski et al. 2021), and but can be accounted for in analyses if needed (Rota et al. 2016). The locations of arrays themselves was up to the local collaborator running the camera, but our goal was to obtain data across a broad range of habitats and disturbance levels. Sampling includes all ecological regions of the contiguous United States (Figure 1), and come from forests, grasslands, deserts, and anthropogenic landscapes. The data also vary in their proximity to human disturbance and are thus suitable to examine broad-scale analyses of wildlife communities along an urban to wild gradient. All mammals and birds detected during the survey are included. All mammals were identified to species level when possible (more difficult with smaller species, Kays et al. 2022). Terrestrial birds and other large recognizable birds were classified to species, but other taxa including smaller migratory birds and reptiles were typically not identified beyond their class due to inconsistencies in sampling these populations with camera traps.

This data set includes 166,335 observations of free-ranging mammals, birds, and humans (Table 2, Figure 2). Eastern gray squirrel (*Sciurus carolinensis*) was the most commonly detected species, followed by white-tailed deer (*Odocoileus virginianus*), in a reversal of their relative position from Snapshot USA 2019 (Cove et al. 2021). The standard protocol used by Snapshot USA (unbaited cameras at knee-height) is most effective for large and medium-sized

(>90g) mammals and terrestrial birds, as seen by large sample sizes for a variety of ungulates, carnivores, squirrels, rabbits, and terrestrial birds.

The data associated with these camera trap photos will be valuable for assessing species distributions and relative abundance. The coordinated effort associated with this camera trap survey will allow for extensive comparative work in animal activity patterns and habitat associations across large portions of species' distributions. For example, relative patterns of wild mammal and human daily activity pattern varies across four levels of development (Figure 3). Additionally, because our 'snapshot' approach collects data only during two months, in the same season each year, we can robustly compare the detection rate and occupancy of many species across sites without having to account for seasonality in detection probabilities, detection rates, or changes in activity of species that migrate or hibernate (Kays et al. 2020).

This second year of data provides a unique opportunity to evaluate changes in animal communities over time, which should be especially interesting given the two years include both before and during the COVID-19 global pandemic, with associated changes in human activity (i.e. the Anthropause; Rutz et al. 2020). The rate of detections from systematic unbaited camera trap arrays can monitor population change for a wide variety of species through estimates of occupancy and relative abundance (i.e. detection rate; Hofmeester et al. 2019, Parsons et al. 2017). There are a number of new approaches for using detection rate from camera traps to estimate absolute animal density if additional information is available (e.g. distance data or movement rates Gilbert et al. 2021). Although a detailed analysis is beyond the scope of this paper, we did compare the overall spatial and temporal variance with a regression model using year and array as explanatory variables for variation in the detection rate of 38 species sampled by 58 camera arrays in both 2019 and 2020. For this exploratory analysis we used a Poisson

distribution, as is frequently used when modeling detection rates by camera trap studies (Rocha et al 2016, Parsons et al 2017). We modeled the count of detections at each camera array, with the total sample effort (camera-days) as an offset. This effectively compares detection rates, which we plot in Figure 3, with Bonferroni adjusted P values based on the 58 site comparisons. Spatial variation (differences across arrays) explained much more variation in relative abundance (84.3% across all species) than year (0.7%), or than a year*array interaction (15.0%). However, there were 94 significant ($p<0.05$) year*array interactions suggesting local-level changes in relative abundance. The three species with the most significant changes in local abundance (Figure 4) were eastern gray squirrel (6 increases, 1 decline), bobcat (4 increases, 2 declines), and Virginia opossum (3 increases, 2 declines).

We are currently preparing data from year 3 of SNAPSHOT USA (September-October 2021) and for a first year of SNAPSHOT Europe, so as these data scale up they will be useful for examining population dynamics of species in response to global change.

Figure 1. Map of the 103 SNAPSHOT USA 2020 camera trap arrays across various ecoregions with size corresponding with the number of animal detections

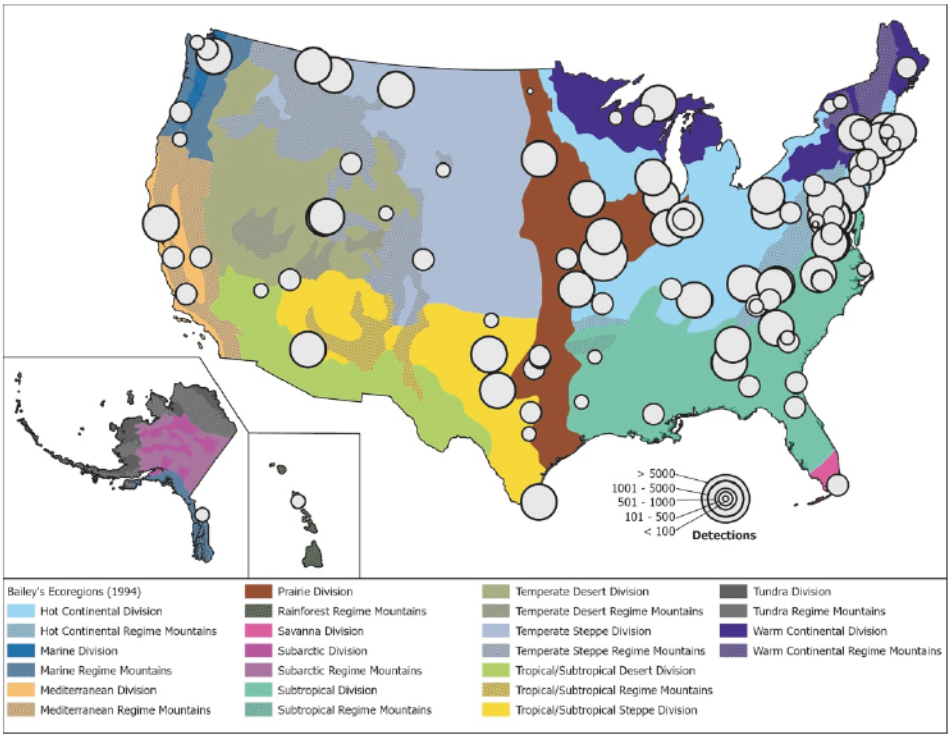

Figure 2. Total number of detections for the 30 most commonly detected wild mammal species from SNAPSHOT USA 2020.

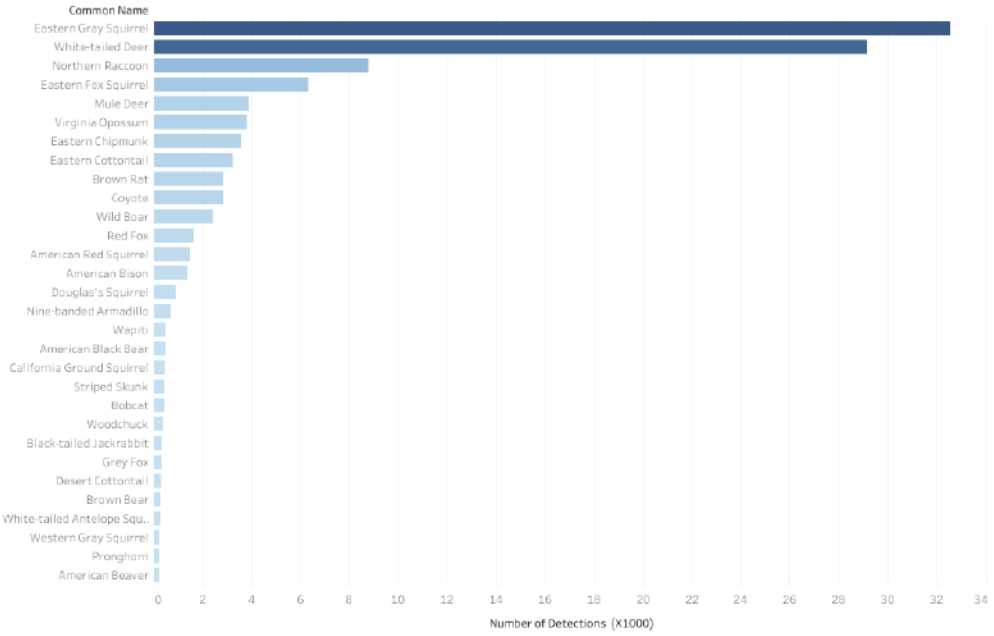

Figure 3. Activity patterns for all wild mammals (orange) and humans (blue) captured in camera traps run at four levels of human development: A) urban, B) suburban, C) rural, D) wild. The values on the y-axis are scaled for the total amount of human or mammal activity in each development zone and thus show relative patterns across groups and zones, but not absolute magnitude of activity.

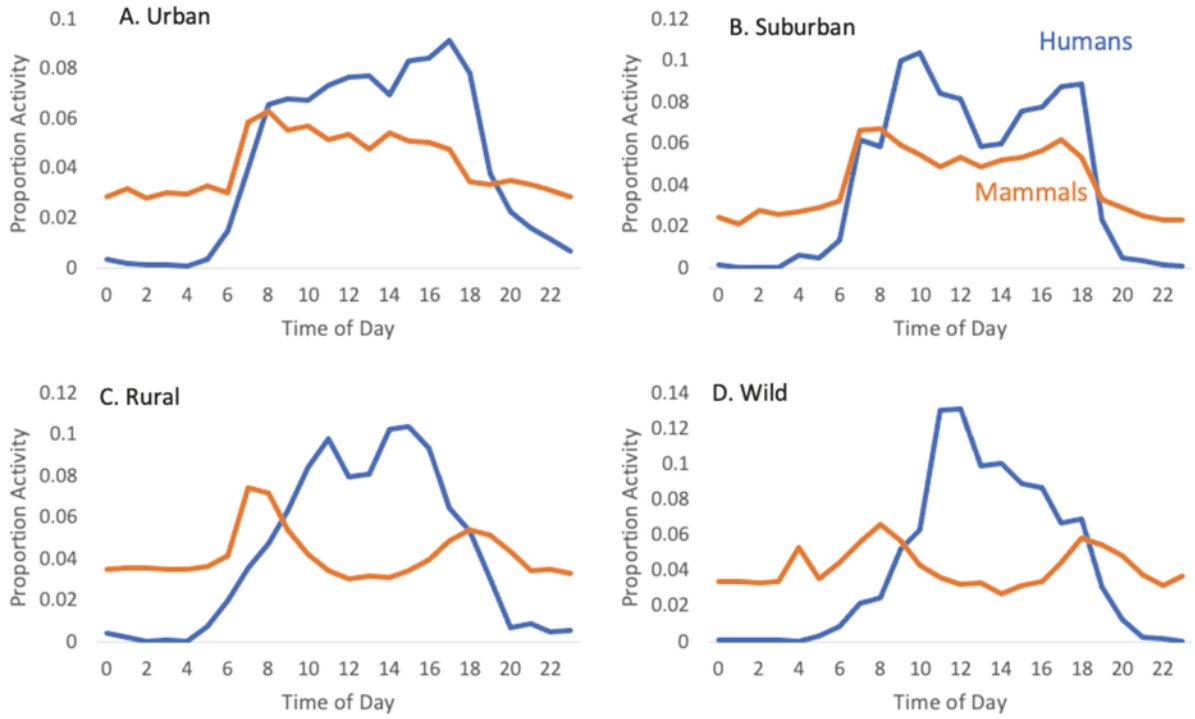

Figure 4. Changes in the relative abundance (mean detection rates±SE) for eastern gray squirrels (A), Virginia opossums (B), and bobcats (C) at Snapshot USA sites monitored in both 2019 and 2020. Sites with Bonferroni corrected statically significant array*year differences are indicated with a *. Only arrays with at least 10 detections are plotted.

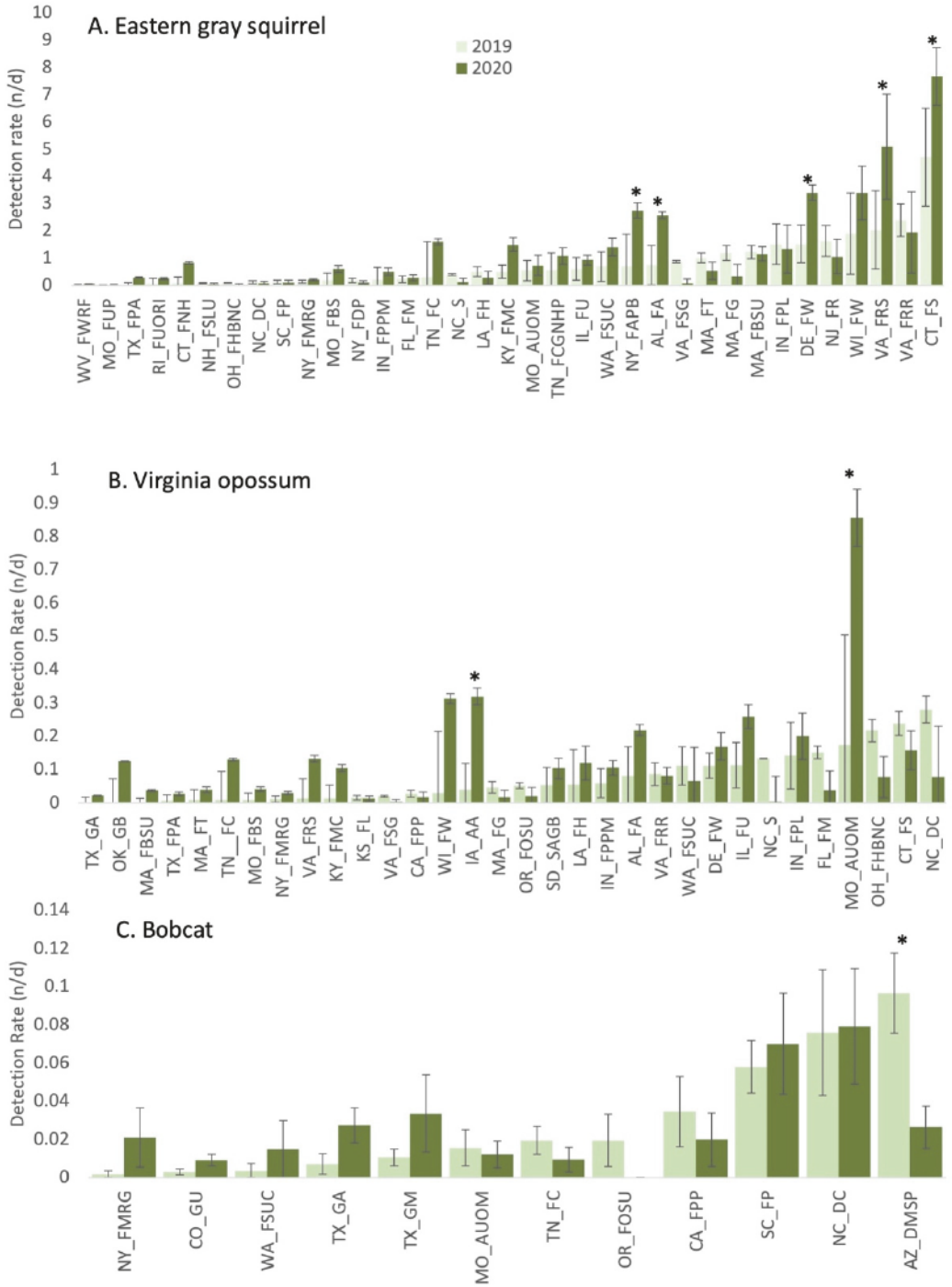

Table 1. Description of the distribution of sample effort during Snapshot USA 2020, consisting of 1485 locations across 103 arrays for a total of 52710 camera-nights of survey effort.

Array	Locations Monitored	Survey Effort (Camera-Nights)
AK_Forest_Chilkat_Preserve_20	7	464
AL_Forest_Auburn_20	14	560
AR_Grassland_Grandview_Prairie_20	10	359
AZ_Desert_McDowell_Sonoran_Preserve_20	10	454
CA_Forest_Pepperwood_Preserve_20	12	435
CA_Forest_Sierra Nevada_20	9	466
CA_Grassland_Carrizo_Plains_20	14	436
CA_Oak_Woodland_Osos_20	11	275
CO_GrasslandOak_USAFA_20	21	1042
CT_Forest_Nye_Holman_20	14	528
CT_Forest_Storrs_20	10	436
DC_Urban_HH_Sites_20	22	326
DC_Urban_HL_Sites_20	57	852
DC_Urban_LL_Sites_20	13	195
DC_Urban_MH_Sites_20	24	338
DC_Urban_ML_Sites_20	42	630
DE_Forest_Wilmington_20	14	474
FL_Forest_Melrose_20	11	318
FL_KeyLargo_20	15	589
GA_Forest_Carrollton_20	27	387
GA_Forest_Ceylon_20	6	294
GA_Forest_Jones_Center_20	23	725
HI_Forest_O'ahu_20	9	202
IA_Anthropogenic_Ames_20	30	497
IL_Anthropogenic_Aurora_20	8	375
IL_Forest_Urbana_20	13	377
IN_Forest_Purdue_Lugar_20	8	384
IN_Forest_Purdue_PWA_Martell_20	6	254
KS_Forest_Lawrence_20	14	379
KS_Forest_Pittsburg_20	11	547
KY_Forest_Marshall_County_20	15	308
LA_Forest_Hammond_20	9	437
MA_Forest_Bridgewater_State_University_20	8	504
MA_Forest_Grafton_20	6	282
MA_Forest_Tufts_20	10	500

ME_Forest_Piscataquis_County_20	8	321
MI_Forest_Upper_Peninsula_2_20	10	900
MI_Forest_Upper_Peninsula_20	26	1454
MI_Forest_Upper_Peninsula_3_20	39	379
MO_Anthropogenic_University_of_Missouri_20	16	1023
MO_Forest_Bull_Shoals_20	10	526
MO_Forest_HBHM_Acres_20	9	542
MT_Forest_River_Trail_20	11	426
MT_Grassland_SCBI_20	65	2354
MT_Roosevelt_Ranch_20	30	1750
NC_Anthropogenic_WCU_20	8	333
NC_Forest_Alligator_River_NWR_20	9	245
NC_Forest_GW_Hill_Forest_20	18	504
NC_Forest_Mt_Glum_20	10	422
NC_Forest_Schenck_20	9	281
NC_Forest_Seven_Devils_20	21	718
NC_Forest_Umstead_20	36	1001
NC_Forest_WCU_20	7	223
NC_Forest_Yarnall_Knob_20	10	503
ND_Grassland_Oakville_Prairie_20	10	247
NJ_Forest_Rutgers_20	7	179
NV_Desert_Mojave_20	9	419
NY_Anthropogenic_NYC_20	20	1017
NY_Forest_Albany_Pine_Bush_20	14	504
NY_Forest_Dyken_Pond_20	15	480
NY_Forest_Mianus_River_Gorge_20	19	753
NY_Forest_Paul_Smiths_College_20	5	131
NY_Forest_St_Lawrence_University_20	12	315
OH_Forest_G_Cubed_Ranch_20	12	540
OH_Forest_Huston-Brumbaugh Nature Center_20	10	470
OK_Grassland_Ardmore_20	14	265
OK_Grassland_Burneyville_20	13	260
OR_Forest_Cow_Creek_20	13	280
OR_Forest_Oregon_State_University_20	15	743
PA_Forest_Gettysburg_College_20	7	206
PA_Forest_Rothrock_20	12	591
RI_Forest_University_of_Rhode_Island_20	9	349
SC_Bottomland_SREL_20	26	390
SC_Forest_Piedmont_20	6	357
SC_Forest_SREL_20	21	450

SD_Grassland_Custer_County_20	10	530
SD_Shelterbelt_and_Grassland_Brookings_20	9	432
TN_Forest_Cheatham_20	12	416
TN_Forest_Cumberland Gap National Historical Park_20	5	293
TX_Forest_Caesar_Kleberg_20	7	442
TX_Forest_LBJ_National_Grasslands_20	18	401
TX_Forest_Pineywoods_Angelina_20	15	327
TX_Forest_USACE_Army_20	12	384
TX_Grassland_Abilene_20	11	682
TX_Grassland_Freeman_Center_20	7	302
TX_Grassland_GP_WMA_20	8	312
TX_Grassland_Matador_20	12	525
UT_Desert_Cottonwood_Canyon_Road_20	15	917
UT_SLC_20	17	459
UT_Wasatch_20	15	523
VA_Forest_Caroline_County_20	8	472
VA_Forest_Richmond(rural)_20	8	426
VA_Forest_Richmond(suburban)_20	7	315
VA_Forest_SCBI_20	15	370
VA_Forest_Shenandoah_20	16	383
WA_Forest_Lower_Elwha_20	12	791
WA_Forest_Olympic_Peninsula_20	12	1369
WA_forest_Seattle_20	9	515
WI_Forest_Chequamegon-Nicolet	9	540
WI_Forest_Whitewater_20	8	364
WV_Forest_University_Research_Forest_20	33	735
WY_Forest_Craighead_20	11	458

Table 2. Species detected in Snapshot USA 2021 organized into species groups (Birds, Domestics, Humans, Wild Mammals) and sorted by their relative abundance. Numbers to the right indicate the total number of detections, the number of camera locations a species was detected at, and the number of arrays they were detected at. Generally, camera trapping is useful for sampling larger terrestrial birds, for which we include the common name, but not as much for smaller birds, which we indicate as 'Other Bird Species' in the common name. CameraTrapper refers to the human setting or retrieving the camera, while all other human pedestrians are classified as Human non-staff.

Group	Common Name	Species Name	Arrays	Sites	Detections
Bird	Other Bird Species	Other Bird Species	82	385	3086
Bird	Other Bird Species	*Turdus migratorius*	41	141	1398
Bird	Other Bird Species	Unknown Bird	74	271	1388
Bird	Wild Turkey	*Meleagris gallopavo*	48	179	1274
Bird	Gambel's Quail	*Callipepla gambelii*	3	17	479
Bird	Other Bird Species	Unknown Ground-Dove	10	64	343
Bird	Other Bird Species	*Cyanocitta cristata*	37	85	255
Bird	Other Bird Species	*Colaptes auratus*	18	33	127
Bird	American Crow	*Corvus brachyrhynchos*	18	38	101
Bird	Owl species	Owl species	25	29	87
Bird	Chihuahuan Raven	*Corvus cryptoleucus*	1	3	80
Bird	Raptor Species	Raptor Species	34	49	76
Bird	Common Raven	*Corvus corax*	7	21	71
Bird	Greater Roadrunner	*Geococcyx californianus*	6	20	70
Bird	Other Bird Species	*Cyanocitta stelleri*	6	27	61
Bird	Other Bird Species	*Cyanocorax yncas*	1	7	56
Bird	Ruffed Grouse	*Bonasa umbellus*	11	17	36
Bird	Plain Chachalaca	*Ortalis vetula*	1	3	29
Bird	Bald Eagle	*Haliaeetus leucocephalus*	2	3	26
Bird	Common Pheasant	*Phasianus colchicus*	2	6	26
Bird	American Robin	*Turdus migratorius*	3	7	22
Bird	Other Bird Species	*Cardinalis cardinalis*	1	4	20
Bird	Northern Bobwhite	*Colinus virginianus*	3	7	17
Bird	Turkey Vulture	*Cathartes aura*	6	9	17

Bird	Mountain Quail	*Oreortyx pictus*	2	7	11
Bird	Unknown Bird	Unknown Bird	4	8	11
Bird	Black Vulture	*Coragyps atratus*	2	2	10
Bird	California Quail	*Callipepla californica*	1	1	9
Bird	Other Bird Species	*Melanerpes erythrocephalus*	1	2	9
Bird	Sharp-tailed Grouse	*Tympanuchus phasianellus*	2	3	9
Bird	Sandhill Crane	*Grus canadensis*	2	3	5
Bird	Dusky Grouse	*Dendragapus obscurus*	1	3	4
Bird	Barred Owl	*Strix varia*	1	1	3
Bird	Great Blue Heron	*Ardea herodias*	1	3	3
Bird	Spruce Grouse	*Falcipennis canadensis*	1	1	3
Bird	Greater Sage-grouse	*Centrocercus urophasianus*	1	1	2
Bird	Other Bird Species	*Aphelocoma californica*	1	2	2
Bird	Other Bird Species	*Quiscalus quiscula*	1	1	2
Bird	Canada Goose	*Branta canadensis*	1	1	1
Bird	Other Bird Species	*Columbina minuta*	1	1	1
Bird	Other Bird Species	*Dendrortyx barbatus*	1	1	1
Bird	Other Bird Species	*Gymnorhinus cyanocephalus*	1	1	1
Bird	Other Bird Species	*Leptotila verreauxi*	1	1	1
Bird	Other Bird Species	*Spilopelia chinensis*	1	1	1
Bird	Unknown Ground-Dove	Unknown Ground-Dove	1	1	1
Bird	Wood Duck	*Aix sponsa*	1	1	1
Domestics	Domestic Dog	*Canis familiaris*	64	287	6229
Domestics	Domestic Cow	*Bos taurus*	13	69	5119
Domestics	Domestic Cat	*Felis catus*	43	215	4277
Domestics	Domestic Horse	*Equus caballus*	13	28	211
Domestics	Domestic Sheep	*Ovis aries*	2	2	12
Domestics	Domestic Donkey	*Equus asinus*	1	1	2
Domestics	Domestic Chicken	*Gallus gallus*	1	1	1
Humans	Human non-staff	Human non-staff	84	516	18404
Humans	Vehicle	Vehicle	50	182	5121
Humans	Bicycle	Bicycle	19	46	300
Humans	Camera Trapper	Human non-staff	1	5	8
Mammal	Eastern Gray Squirrel	*Sciurus carolinensis*	67	640	32534
Mammal	White-tailed Deer	*Odocoileus virginianus*	82	965	29149
Mammal	Northern Raccoon	*Procyon lotor*	87	682	8780
Mammal	Eastern Fox Squirrel	*Sciurus niger*	32	186	6312
Mammal	Virginia Opossum	*Didelphis virginiana*	72	396	3800

Mammal	Mule Deer	*Odocoileus hemionus*	21	214	3719
Mammal	Eastern Chipmunk	*Tamias striatus*	36	151	3583
Mammal	Eastern Cottontail	*Sylvilagus floridanus*	58	256	3220
Mammal	Brown Rat	*Rattus norvegicus*	7	56	2843
Mammal	Coyote	*Canis latrans*	92	512	2841
Mammal	Unknown Small Mammal	Unknown Small Mammal	69	239	2703
Mammal	Wild Pig	*Sus scrofa*	19	134	2364
Mammal	Red Fox	*Vulpes vulpes*	41	195	1649
Mammal	American Red Squirrel	*Tamiasciurus hudsonicus*	20	67	1496
Mammal	American Bison	*Bison bison*	1	50	1395
Mammal	Douglas's Squirrel	*Tamiasciurus douglasii*	7	45	933
Mammal	Unknown Squirrel	Unknown Squirrel	50	162	855
Mammal	Nine-banded Armadillo	*Dasypus novemcinctus*	23	139	692
Mammal	Unknown Deermouse	*Peromyscus Species*	15	27	530
Mammal	Wapiti	*Cervus canadensis*	10	64	505
Mammal	American Black Bear	*Ursus americanus*	28	145	485
Mammal	California Ground Squirrel	*Otospermophilus beecheyi*	2	6	471
Mammal	Striped Skunk	*Mephitis mephitis*	46	124	427
Mammal	Bobcat	*Lynx rufus*	59	189	425
Mammal	Woodchuck	*Marmota monax*	15	37	384
Mammal	Black-tailed Jackrabbit	*Lepus californicus*	5	26	364
Mammal	Grey Fox	*Urocyon cinereoargenteus*	25	73	341
Mammal	Desert Cottontail	*Sylvilagus audubonii*	4	23	327
Mammal	Brown Bear	*Ursus arctos*	4	17	287
Mammal	White-tailed Antelope Squirrel	*Ammospermophilus leucurus*	2	14	264
Mammal	Western Gray Squirrel	*Sciurus griseus*	5	26	249
Mammal	Pronghorn	*Antilocapra americana*	4	31	247
Mammal	American Beaver	*Castor canadensis*	3	4	221
Mammal	Unknown Rabbit_Hare	*Unknown Rabbit_Hare*	20	44	202
Mammal	Unknown Cottontail	Unknown Cottontail	11	40	187
Mammal	Northern Flying Squirrel	*Glaucomys sabrinus*	11	31	178
Mammal	Unknown Flying Squirrel	Unknown Flying Squirrel	13	30	175
Mammal	Snowshoe Hare	*Lepus americanus*	11	27	171
Mammal	Black-tailed Prairie Dog	*Cynomys ludovicianus*	1	2	155
Mammal	Unknown Chipmunk	Unknown Chipmunk	10	34	150
Mammal	White-footed Deermouse	*Peromyscus leucopus*	15	29	141
Mammal	Harris's Antelope Squirrel	*Ammospermophilus harrisii*	1	8	134

Mammal	Unknown Kangaroo Rat	*Dipodomys species*	1	3	134
Mammal	House rat	*Rattus rattus*	2	5	125
Mammal	Collared Peccary	*Pecari tajacu*	3	12	107
Mammal	Gray Wolf	*Canis lupus*	7	37	89
Mammal	Unknown Canid	Unknown Canid	35	57	89
Mammal	Moose	*Alces alces*	5	23	84
Mammal	North American Porcupine	*Erethizon dorsatum*	14	33	75
Mammal	Unknown Cervid	Unknown Cervid	9	32	74
Mammal	Unknown Woodrat	Unknown Woodrat	2	3	69
Mammal	Muskrat	*Ondatra zibethicus*	3	4	55
Mammal	White-tailed Jackrabbit	*Lepus townsendii*	4	9	53
Mammal	Fisher	*Martes pennanti*	10	25	51
Mammal	Puma	*Puma concolor*	10	23	42
Mammal	North American River Otter	*Lontra canadensis*	5	8	40
Mammal	Southern Flying Squirrel	*Glaucomys volans*	10	16	40
Mammal	Southern Plains Woodrat	*Neotoma micropus*	1	3	39
Mammal	Eastern Woodrat	*Neotoma floridana*	5	6	36
Mammal	Merriam's Kangaroo Rat	*Dipodomys merriami*	2	7	33
Mammal	Kit Fox	*Vulpes macrotis*	3	12	32
Mammal	Rock Squirrel	*Otospermophilus variegatus*	4	8	30
Mammal	American Mink	*Neovison vison*	7	12	28
Mammal	Swamp Rabbit	*Sylvilagus aquaticus*	1	2	27
Mammal	Marsh Rabbit	*Sylvilagus palustris*	2	5	22
Mammal	Unknown Small Weasel	Unknown Small Weasel	14	16	19
Mammal	Red Wolf	*Canis rufus*	1	4	14
Mammal	American Badger	*Taxidea taxus*	6	8	12
Mammal	Desert Kangaroo Rat	*Dipodomys deserti*	1	1	12
Mammal	Long-tailed Weasel	*Mustela frenata*	8	8	11
Mammal	Mountain Cottontail	*Sylvilagus nuttallii*	3	3	11
Mammal	American Marten	*Martes americana*	4	6	8
Mammal	Cotton Mouse	*Peromyscus gossypinus*	1	3	8
Mammal	Ermine	*Mustela erminea*	5	6	7
Mammal	Mountain Beaver	*Aplodontia rufa*	2	4	6
Mammal	Western Spotted Skunk	*Spilogale gracilis*	4	5	6
Mammal	Yellow-pine Chipmunk	*Neotamias amoenus*	1	1	6
Mammal	Brush Rabbit	*Sylvilagus bachmani*	1	1	5
Mammal	Bushy-tailed Woodrat	*Neotoma cinerea*	2	2	5
Mammal	Abert's Squirrel	*Sciurus aberti*	1	1	4
Mammal	Unknown Rattus	*Rattus Species*	2	2	4

Mammal	Desert Woodrat	*Neotoma lepida*	1	1	3
Mammal	House Mouse	*Mus musculus*	1	1	2
Mammal	Bighorn Sheep	*Ovis canadensis*	1	1	1
Mammal	Dusky-footed Woodrat	*Neotoma fuscipes*	1	1	1
Mammal	Eastern Spotted Skunk	*Spilogale putorius*	1	1	1
Mammal	Golden Mantled Ground Squirrel	*Callospermophilus lateralis*	1	1	1
Mammal	Hispid Cotton Rat	*Sigmodon hispidus*	1	1	1
Mammal	Lodgepole Chipmunk	*Neotamias speciosus*	1	1	1
Mammal	Panamint Chipmunk	*Neotamias panamintinus*	1	1	1
Mammal	Ringtail	*Bassariscus astutus*	1	1	1
Mammal	Unknown Felid	Unknown Felid	1	1	1
Mammal	Unknown Pig_Peccary	Unknown Pig_Peccary	1	1	1
Other	No Animal	No Animal	100	1185	49717
Other	Unknown Animal	Unknown Animal	101	822	3881
Other	Camera Trapper	Camera Trapper	97	1286	3658
Other	Reptile Species	Reptile Species	5	16	172
Other	No Animal	Camera Misfire	4	12	115

Class II. Research origin descriptors

A. Overall project description

1. Identity: Camera trap data from a coordinated survey the USA in 2020.

2. Originators: This second annual SNAPSHOT USA survey was coordinated by Roland Kays, Michael Cove, and William McShea, with all co-authors contributing camera trap data or data management support. The eMammal Data Repository was developed by the Smithsonian Conservation Biology Institute (Lead PI: W. McShea) and North Carolina Museum of Natural Sciences (Lead PI: R. Kays) with assistance from Smithsonian Repository (Daniel Davis and Beth Stern), Quotient, BlueRaster, Amazon Web Services, and the San Diego Supercomputer Center's Advanced Cyberinfrastructure Development Lab. The data for this paper were downloaded directly from the eMammal Data Portal (https://www.eMammal.si.edu/data-download) from the Smithsonian Repository that is accessible for public use.

3. Period of Study: 14 July 2020 through 3 December 2020

4. Objectives: The goal of SNAPSHOT USA is to facilitate collaboration in creating a national database of public wildlife data. Our first objective is to provide these data annually for their use in conservation and ecological research to examine nationwide trends in mammal communities associated with environmental and anthropogenic landscape variables to better inform management of natural resources and conservation actions. Our second objective is to share this knowledge about wildlife distributions and their interactions with humans, to provide educational opportunities through the development of classroom materials for students from secondary through undergraduate education and through the development of crowd-sourcing of animal identifications in future iterations of SNAPSHOT USA coordinated camera trap surveys.

B. Research Origin Description

1. Site description: These data come from 103 camera arrays, 58 of which were also sampled in 2019 (Figure 1) (Cove et al. 2021). The United States is home to approximately 192 mammal species that are readily detected with camera traps (e.g., >50g), although most camera trap detections come from medium and large mammals (e.g., >500g). The study sites from the contiguous United States exhibit a broad latitudinal range from 25.17° N to 46.08° N and altitudinal range, and includes additional ecoregions associated with noncontiguous states of Alaska (59.43° N) and Hawaii (21.36° N). These broad ranges of latitude, elevation, climate, along with variation in coastal and inland areas create a vastly heterogenous landscape with 12 ecoregions represented in our camera trap sampling (Figure 1). The specific camera trap locations were deployed in forests, grasslands, deserts, and anthropogenic landscapes, with variable proximity to human disturbance along an urban to wild gradient.

2. Source (s) of funding: The Smithsonian Institution provided support and data storage in the Smithsonian repository, with additional support from the National Science Foundation award DEB – 1754656, and those listed in the Acknowledgements for site-specific projects.

3. Data compilation:

We compiled all data through eMammal (eMammal.si.edu). All authors and their teams contributed data or assisted with expert review and data cleaning within the eMammal repository. Data was downloaded as a CSV file on 31 May 2021 and manually cleaned by the PIs and eMammal team.

4. Research methods:

We coordinated surveys with all cooperators with the goal of collecting a minimum of 400 camera-nights of camera trap data from camera trap arrays (clusters of camera trap sites) during the months of September and October 2020. Cooperators adhered to the following protocol:

1) Each cooperating team self-identified their camera trap arrays by selecting one combination of setting (Urban, Suburban, Rural, Wild) and habitat (Forest, Grassland, Desert, Anthropogenic, Other) to standardize and focus on where deploying their camera trap sites in each array. Camera trap arrays were amorphous and not necessarily systematic grids, with random sites selected to fit within study spacing guidelines and logistical constraints of a particular location. Camera spacing guidelines allowed for sites that were at least 200 meters apart from other cameras, with no single cameras greater than 5 kilometers from another camera.

2) Camera traps were deployed across 7 to 50 camera trap sites matching the selected setting-habitat combination to form each camera trap array, although due to camera functional issues the final number of camera trap sites in each array ranged from 5 to 65 cameras. The location, start date, end date, and camera make and model for each deployment were recorded. We ensured that

all cooperators used comparable motion-sensitive, infrared or white-flash trail cameras with fast (<0.5s) trigger speeds. Cameras were set to take 1-10 photos per trigger and cameras were armed to take photos without a quiet period between triggers. Approved cameras were those with a trigger time <0.5 seconds including Browning (Strike Force Elite HD, 2017 Strike Force HD Pro, or camera of equal or greater quality), Bushnell (Trophy Cam HD, Essential, Aggressor, or camera of equal or greater quality), Moultrie (M-999I, M-1100i, or camera of equal or greater quality), Primos (Proof Cam 02, Proof Cam 03, or camera of equal or greater quality), Reconyx, (all models), Spypoint (Solar, Force 10, Force 11D, Force GM, or camera of equal or greater quality), and Stealth Cam (G45NP Pro, G42NG, or camera of equal or greater quality).

3) Cameras were placed ~50 cm off the ground, parallel to the ground with horizontal orientation. The direction of each camera was not standardized or recorded, but we suggested that camera orientation to the North or South is effective to reduce sun glare in resulting camera trap images.

4) No food bait or scent lure was used.

5) Cameras could be placed on trails or logging roads or water features, but this was indicated by cooperators.

After removing camera traps, project cooperators and their students uploaded all data to the eMammal Data Management System (emammal.si.edu) using the eMammal desktop application. The eMammal desktop app aggregates photos into sequences such that species detections were only considered independent if they were greater than one-minute apart. Each participant identified the species in their sequences using the eMammal desktop software to register this information. These results were then reviewed by another expert to confirm or correct all species identifications or counts. We rejected any deployments that did not meet

standard procedures, which were typically deployed too high or too low to detect most common species. Three authors (M. Allen, M. Cove, R. Kays) confirmed all difficult species identifications and were responsible for most of the expert review of SNAPSHOT USA deployments in eMammal. We reached out to taxonomical experts when necessary and adjusted species identifications to the lowest possible taxonomical unit when unable to identify an animal to species. Non-target species (e.g., small migratory birds, reptiles) were typically only identified to class because species identification was difficult, but also because camera traps are not reliable survey approaches for these species in the current study design. Age and sex of animals is not typically obvious in photographs and we did not require participants code this information. Furthermore, the criteria to judge relative age is not well established and likely to vary across species. Nontheless, some groups did record these data for some species, using their own criteria. We encourage any future efforts interested in comparing the age or sex of animals across study sites to view the photographs in eMammal or Wildlife Insights and code the data themselves, using a consistent protocol.

5. Taxonomic data: We followed the IUCN Red List (2019) for species taxonomy classifications.

C. Data limitations and potential enhancements

Camera traps are limited in their ability to survey entire mammal communities. In particular, the assumption that species are always detected when present is problematic because species vary in body size, home range size, and behavior, all of which are traits associated with imperfect detection (Rowcliffe et al. 2011, Hofmeester et al. 2019). Therefore, for any cross-species comparisons, we recommend accounting for differences in species-specific detection probabilities by employing analyses such as occupancy models and integrated species

distribution models to explicitly account for these potential data (MacKenzie et al. 2006). Additionally, we report the survey effort (e.g., start and end dates to calculate the number of camera-nights) associated with each deployment to allow researchers to account for survey effort in relative abundance and detection rate models (e.g., Kays et al. 2017). Counts of animals detected may not always reflect true abundance because in many cases animals cannot be uniquely identified for robust abundance analyses such as capture-recapture or spatial capture-recapture (Royle et al. 2013). For those species where individual identification is possible (e.g., bobcats *Lynx rufus* (Heilbrun et al. 2006) and antlered deer (Parsons et al. 2017)), we recommend reviewing the raw photos (https://emammal.si.edu/analysis/view-images) to identify individuals for proper analyses and inference. These pictures will also be available in the future from WildlifeInsights.org.

Furthermore, the data reported herein come from a single "snapshot" of biodiversity across our camera trap arrays in the fall of 2020. While the approach helps simplify analyses because data come from the same date ranges, it should be noted that long-term, multi-season data are important for strong population- and community-level inferences and the SNAPSHOT USA data may not be applicable to more advanced models given the short sampling window. Populations and communities are dynamic (e.g., species migrate, hibernate, occur in source-sink and/or meta-populations, etc.), so we anticipate that many questions in ecology and conservation will be best approached with additional years of data. We (the authors here, as well as new cooperators) are currently running camera traps for SNAPSHOT 2021, and plan to continue sampling into the future to expand survey coverage, periods of sampling, and to survey additional seasons for more robust analyses in the future.

CLASS III. DATA SET STATUS AND ACCESSIBILITY

A. Status

1. Latest update: 17 November 2020

2. Latest archive date: 17 November 2020

3. Metadata status: Last updated 17 November 2020, version submitted

4. Data verification: We verified data by creating summary graphics and sharing with data contributors to confirm latitude, longitude, and start and end dates of camera trap surveys were correct. Three authors (M. Allen, M. Cove and R. Kays) confirmed all difficult wildlife identifications and were responsible for most of the expert review in eMammal, reaching out to taxonomical experts when necessary, and correcting species identifications when incorrectly identified at initial data upload.

B. Accessibility

1. Contact persons: Roland Kays (rwkays@ncsu.edu), North Carolina Museum of Natural Sciences, Raleigh, NC 27601, USA.

2. Storage location

In addition to this publication, the 2020 data and data from previous SNAPSHOT USA 2019 surveys can be downloaded directly from the eMammal Data Repository (https://emammal.si.edu/analysis/data-download) in CSV format. To obtain these data draw a search box across North America and select the Snapshot 2020 study. However, we recommend using this cleaned dataset (and other future data papers) over redownloading data and only recommend going back to eMammal if raw camera trap photos need to be reviewed. The raw camera trap photos can be accessed in JPEG format (https://emammal.si.edu/analysis/view-images). These data and new Snapshot surveys will be integrated directly into Wildlife Insights

(Ahumada et al. 2020) in the future, and be available by searching for the Snapshot USA projects.

3. Copyright restrictions: None.

4. Proprietary restrictions: Please cite this paper when using the data for publication.

5. Costs: None.

CLASS IV. DATA STRUCTURAL DESCRIPTORS

A. **Data Set File**

1. Identity: DataS1.zip contains:

SNAPSHOT_USA_2020_observations.csv;

SNAPSHOT_USA_2020_deployments.csv

2. Size: Total: 3.0 MB (zip)

223879 rows, 11 columns, 33.3 MB

1486 rows, 16 columns, 233 KB

3. Format and storage mode: comma-separated values (.csv)

4. Header information: See column descriptions in section B.

5. Alphanumeric attributes: Mixed.

6. Special characters/fields: None

7. Authentication producers: None

B. Variable information

1) Table 2. Variable information for Observation Data.

Variable	Potential Categories	Definition/Meaning

Camera_Trap_Array	One of 102 potential text strings representing the different camera trap arrays herein.	Each camera trap array represents one subproject on eMammal.
Site_Name	One of 1481 potential text strings associated with specific camera trap sites within each array.	Name assigned to each camera trap site in each camera trap array.
Deployment_ID	One of 1481 potential text strings associated with specific camera trap deployments across sites. All deployment IDs start with 'd', e.g., d1234	Unique identifier for a camera trap deployment from eMammal. Most sites are associated with a single Deployment_ID, but camera photos could be uploaded in batches corresponding with multiple eMammal deployments from the same site. These should only be used when referencing back to eMammal.
Sequence_ID	Text string associated with a specific observation from a camera trap site. Sequence_ID includes the associated Deployment_ID followed by 's', and the chronological order of the observation sequence number (e.g., d1234s2 is the	Unique identifier for a camera trap observation. Observations are a sequence of all camera trap photos within one minute of a single camera trigger. Multiple species will be identified in separate rows for the same Sequence_ID, so Sequence_ID can repeat. These can be used to review original photos in

	second sequence of deployment d1234)	eMammal. In some cases, Sequence_ID was lost ('NA') and we recommend reviewing all photos in those deployments, if necessary, to review raw camera trap images.
Begin_Time	Date and time stamp associated with a camera trap observation provided in the following format: "YYYY-MM-DD HH:MM:SS". Begin_Time values are between "2020-07-14 11:57:00" and "2020-12-03 14:02:00".	Timestamp of first camera trap photo in each camera trap sequence.
End_Time	Date and time stamp associated with a camera trap observation provided in the following format: "YYYY-MM-DD HH:MM:SS". End_Time values are between "2020-07-14 11:57:00" and "2020-12-03 14:02:00".	Timestamp of last camera trap photo in each camera trap sequence.
Species_Name	Text string, provided in the format "*Genus species*" for	The binomial scientific name or lowest possible taxonomy of the species observed

	identifiable species, with lowest possible taxonomy in cases where species identity is unknown as cleaned from eMammal for SNAPSHOT USA.	in the sequence observation.
Common_Name	Text string of species common names.	Common name of the species observed in the sequence observation.
Age	Text string, options include: Adult, Juvenile, Unknown	Age category of animal observed, if distinguishable by observer. Default is unknown since this was not consistently recorded.
Sex	Text string, options include: Female, Male, Unknown	Sex category of animal observed, if distinguishable by observer. Default is unknown since this was not consistently recorded.
Count	Integer between 1 - 106	Number of individuals observed in a single camera trap sequence observation.

2) Table 3. Variable information for Deployment Data.

Variable	**Potential Categories**	**Definition/Meaning**

Camera_Trap_Array	One of 102 potential text strings representing the different camera trap arrays herein.	Each camera trap array represents a subproject in eMammal.
Site_Name	One of 1481 potential text strings associated with specific camera trap sites within each array.	Name of each assigned to camera trap site in each camera trap array.
Deployment_ID	One of 1481 potential text strings associated with specific camera trap deployments. All deployment IDs start with 'd', e.g., d1234	Unique identifier for a camera trap deployment from eMammal. Most sites are associated with a single Deployment_ID, but camera photos could be uploaded in batches corresponding with multiple eMammal deployments from the same site. These should only be used when referencing back to eMammal.
Date_Out	Date camera was placed provided in the following format: "YYYY-MM-DD". Date_Out values are between "2019-08-17" and "2019-11-24".	Date of the camera trap deployment.
Date_Retrieved	Date camera was retrieved	Date of the camera trap retrieval.

	provided in the following format: "YYYY-MM-DD". Date_Retrieved values are between "2019-08-17" and "2019-11-24".	
Survey_Days	Integer between 1 - 92	Number of trapdays per deployment.
Latitude	Double precision vector between 21.36077 and 59.42643	Latitude value of camera trap site location. All geographic coordinates are provided in decimal degrees (WGS 84).
Longitude	Double precision vector between -157.74786 and -69.1049	Longitude value of camera trap site location. All geographic coordinates are provided in decimal degrees (WGS 84).
Time_Zone	One of six possible text strings	Time zone associated with specific camera trap site.
Development	One of four possible text strings representing the development level associated with specific camera trap deployment.	This is from contributing authors.
Detection Distance		
Feature_Water	Binary (1=water available, 0=not available)	Denotes if camera was directed at water source.

Feature_Road	Binary (1=road, 0=not on road)	Denotes if camera was directed at an access road (dirt or paved).
Feature_Human_Trail	Binary (1=trail, 0=not on trail)	Denotes if camera was directed at a human-made trail. Missing values denote uncertainty
human_pics_removed	Binary (1=removed, 0=not removed)	Denotes if human pictures were removed from the deployment before upload.
Deployment_notes	Free text	Notes about the deployment recorded by the camera trapper, could be useful to describe microscale habitat factors

C. DATA ANOMALIES: In some cases blank photos, and pictures of humans or vehicles were removed manually, or with the Megadetector software (Beery et al. 2019). These are noted in the deployment table field (human_pics_removed).

CLASS V. SUPPLEMENTAL DESCRIPTORS

A. Data acquisition

1. Data request history: None

2. Data set updates history: None

3. Data entry/verification procedures: None

B. History of data set usage: Data are currently in use by the SNAPSHOT USA PIs (authors on this data paper) to examine habitat and anthropogenic filters associated with wildlife

distributions at a national scale, but the data have not been used in previously published research. Please consider reaching out to Michael Cove, Bill McShea, or Roland Kays if you have questions about ongoing work with these data or are interested in collaborating.

ACKNOWLEDGMENTS

This project was a huge collaboration effort. Thanks to data contributors, students, interns, and citizen scientists with data collection and camera trap image review. The Smithsonian Institution provided support and data storage in the Smithsonian repository, with additional support from the National Science Foundation award DEB - 1754656. State-specific acknowledgements follow. **Alabama:** Autumn Patterson, Olivia Lepczyk, Isabel Lepczyk, Kreher Preserve, and Nature Center; **Alaska:** Stephanie Sell; Arizona: Ralph Lipfert and Mike Wunch, Citizen Scientists at McDowell Sonoran Conservancy; **Arkansas:** Griffin Park, Elliot Lassiter; **California:** Sierra Meadows, Scout Island Educational Center, and Tosha Comendant (Pepperwood Foundation); **Colorado:** Anna Maronick; **Connecticut:** Lindsey Kollmer, Joan Tremblay, Daniel Duque, Michael Lascaleia, James Mickley, Robert Bagchi; **Delaware:** The Delaware Zoological Society, Delaware State Parks, Brandywine Zoo conservation program volunteers, and Caylen Wolfer; **D.C.:** PetSmart Charities, American Society for the Prevention of Cruelty to Animals, The Humane Society of the United States, Winn Feline Foundation, Maddie's Fund, Cat Depot, and B. Von Gontard for major financial support of the D.C. Cat Count and Wildlife Survey.; **Florida:** Andrew D. Rappe, Ordway-Swisher Biological Station, and Jeremy Dixon, Crocodile Lake National Wildlife Refuge; **Georgia:** Contributions of JCB and HB were partially supported through funding from U.S. Department of Agriculture and the U.S. Department of Energy under (DE-EM0004391) to the University of Georgia Research

Foundation. Joanne Wasdin, Tim Hawig and Fall 2020 Environmental Science class at Carrollton High School, Georgia; **Hawaii:** Wade Naguwa; **Illinois:** Fox Valley Park District, Aurora Country Club; **Iowa:** Story County Conservation, Sidney Brenkus, Samuel Stevens and Maura Speck; **Kansas:** Pittsburg State University 2020 Mammalogy students, University of Kansas Field Station, KU Environmental Studies Program, and students of fall 2020 Field Ecology course; **Kentucky:** Jordan Tandy, Evan Barr, Elliot Clouse, Brendan Calhoun, Brianna Gibbons, Clarks River National Wildlife Refuge, The Mcnair's Scholars Program at Murray State University, and The Upper Delta Region Biodiversity Scholarship; **Louisiana:** Southeastern Louisiana University 2020 Mammalogy course: Jordan Abadie, Jocelyn Arciniega, Jacqueline Choudhuri Coe, Natalie Matherne, Amanda Mizell, Constance Pudlewski, Corey Samples, Allison Smith, and Mercy Yang; **Maine:** Maine Department of Inland Fisheries and Wildlife, Cooperative Forestry Research Unit; **Maryland:** Greivin Ulate; **Massachusetts:** Elena Babicz, Alexander P. O'Roak, Dan Rezendes, Great Hill Trails at Bridgewater State University, Office of Undergraduate Research at Bridgewater State University, Center for the Advancement of Research and Scholarship at Bridgewater State University, Town of Amherst Conservation Commission, NRC undergraduate and ECo graduate students, Tufts Conservation Medicine MS'21 students and David Segal; **Michigan:** Greg Hill, Kris Thoreson, Matt Clark, Sarah Coose, Tara Easter, Alexander Killion, Anna Levine, Jessica Mueller, Nicole Nimlos, Abby Sage, Dylan Thompson, NMU Department of Biology, S. J. Gillman, and numerous NMU undergraduates that assisted with imagery analysis, Lux Arbor Reserve; **Minnesota:** John Erb and the Minnesota Department of Natural Resources; **Missouri:** Harrison Stoudt, the Center for Agroforestry, University of Missouri, Missouri State University 2020 Mammalogy Class; **Montana:** American Prairie Reserve, Boone and Crockett Club, University of Montana Boone and Crockett Wildlife

Conservation Program, Theodore Roosevelt Memorial Ranch, Heirmosa Ranch, Arrow S Ranch, Blackfoot Challenge, and all the landowners in Missoula that permitted us to set cameras on their property; **Nebraska:** University of Nebraska-Lincoln Fall 2020 Mammalogy class including: Ian Anderson, Christian Bennett, Peyton Bishop, Katie Boden, Sydney Brewer, Morgahn Bruns, Anne Clement, Katie Desler, Jackson Ebbers, Noah Hines, Emily Hruza, Ryan Jenkins, Briana Kouma, Aaron Lafler, Jana Malene, Abigail Misfeldt, Alexandrea Otto, Taryn Potter, Jessica Smith, Erika Swenson, Clark Ward, Mason Williams; Nevada: Michael Zbiegien; **New Hampshire:** Support for this project was from a T-2-3R grants for Nongame Species Monitoring and Management through the New Hampshire Fish and Game Department (NHFG); **New York**: Ferdie Yau, William Nam, Jessica Joiner, Natalie Panshin, Corinna Pilcher, Leslie Sandefur, Madden Solomon, Donovan Spaulding, Cole Weigartz, Federal Aid in Wildlife Restoration, Safari Club International Foundation, M. Joseph, J. Lutkowski, E. Largent, R. McGillviray, Jean-Luc Plante, School of Science at Siena College, Albany Pine Bush Commission, Dyken Pond Environmental Education Center, Rachel Riemann, Justin Wolford, Laura Bornt, Allyson Paradis, Benjamin Allegro, Aldina Sliwa, Maranda Welch, Students of the Siena College Environmental Science course; **North Carolina**: Brian Rineer, Noel Griffin, NCSU Mammalogy Students, Seth Drake, Edgar Villeda, Dylan Green, Justice Hargett, and Stephanie Dotson, Becky Harrison at Alligator River National Wildlife Refuge; **North Dakota:** UND Biology, UND Wildlife Society; **Oklahoma:** D.T. Warren; **Oregon:** Marcus Bianco, Kyle Yorke, US Forest Service PNW Research Lab; **Pennsylvania:** Oung (Louis) Kant; **Rhode Island:** Ruby M. Nguyen; Kylie M. Rezendes; **South Carolina:** USDA Forest Service, South Carolina Department of Natural Resources, Quality Deer Management Association, Davis Land and Timber, Elizabeth Saldo; **South Dakota:** Marlin Dart; **Tennessee:** Jordan S. Nanney, LMU

Student Chapter of the Wildlife Society; **Texas:** The Raul Tijerina, Jr. Foundation and Texas Parks and Wildlife Department; **Utah:** Reagan Compton, Christine Patrick, The University of Utah's Global Chance and Sustainability Center, the University of Utah's Sustainable Campus Initiative Fund, The Utah Chapter of The Wildlife Society, the Natural History Museum of Utah, Salt Lake City's Trails and Natural Lands Division, Sageland Collaborative, Utah's Hogle Zoo The National Geographic Society, undergraduate students from the University of Utah's Conservation Biology class, Jennifer and Danny Menlove, Mary Ann White, Susan Hagen, Natalie Kline, and all the community scientists of the Wasatch Wildlife Watch Team; **Virginia:** Catherine Unger, Bryan Chase, Tom Thorpe of Henrico County Parks, Bonner Center for Civic Engagement, Andrea Eanes and Zach Harrell, and students in the Fall 2020 Introduction to Ecology Class and the Biodiversity and Conservation Class; **Washington**: Seattle Urban Carnivore Project volunteers and Zooniverse photo classifiers; **West Virginia:** West Virginia University Wildlife and Fisheries Techniques Fall 2020 students and teaching assistants, WVU Davis College of Agriculture, Natural Resources and Design, WVU Division of Forestry and Natural Resources, USDA National Institute of Food and Agriculture, McIntire Stennis project WVA00818; **Wisconsin:** Regina L. Rose, UW-Whitewater's Research Apprenticeship Program (RAP), Snapshot Wisconsin volunteers, collaborators and team members, including trail camera hosts and Zooniverse photo classifiers, and USFWS Pittman-Robertson Wildlife Restoration Program and Wisconsin Department of Natural Resources. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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