Paolo Stefano Segre

Curriculum Vitae

University of Wisconsin, Green Bay 2420 Nicolet Dr, Green Bay, WI 54311 Website: segre-ecophysiology-lab.github.io E-mail: segrep@uwgb.edu

Education

- 2015 Ph.D. Zoology, University of British Columbia, Advisor: Douglas Altshuler
- 2006 M.Sc. Organismal Biology, University of Montana; Advisor: Ken Dial
- 2003 B.Sc. General Biology, University of Illinois, Urbana-Champaign

Professional Appointments

- 2023 Present Assistant Professor of Biology, University of Wisconsin, Green Bay
- 2020 2023 Lecturer, California State University, Chico
- 2019 2023 Researcher, Stanford University
- 2015 2019 Postdoctoral Researcher, Stanford University

Manuscripts

* denotes shared first-authorship † denotes undergraduate co-author

- 2024 Ayoub, A; Segre, PS; Hickmott, L; Warren, JD; Chiang, G; Bahamonde, P; and A Bocconcelli. **Feeding behavior of blue whales** (*Balaenoptera musculus*) during austral summer in northern Chilean Patagonia. *Ethology, Ecology, & Evolution.*
- 2024 Fish, FE; Nicastro, AJ; Cardenas, KL; Segre, PS; Gough, WT; Kahane-Rapport, SR; Leger, JS; and JA Goldbogen. **Spin-leap performance by cetaceans is influenced by moment of inertia.** *Journal of Experimental Biology.*
- 2024 Ryan, C; Martins, MCI.; Healy, K; Bejder, L; Cerchio, S; Christiansen, F; Durban, J; Fearnbach, H; Fortune, S; Friedlaender, A; Kotik, C; Koski, WR; Miller, C; Rodríguez-González, FM; Segre, PS; Urban R, J; Vivier, F; Weir, CR; and MJ Moore. **Morphology of nares associated with stereo-olfaction in baleen whales.** *Biology Letters*.
- 2023 Videsen, KA; Simon, M; Christiansen, F; Friedlaender, A; Goldbogen, J; Malte, H; Segre, P; Wang, T; Johnson, M; and PT Madsen. **Cheap gulp foraging of a giga-predator enables efficient exploitation of sparse prey.** *Science Advances.*
- 2023 Segre, PS; Martin, J; Irschick, DJ; and JA Goldbogen. **A three-dimensional, dynamic blue whale model for research and scientific communication.** *Marine Mammal Science.*
- 2022 Segre, PS; Gough, WT; Roualdes, EA; Cade, DE; Czapanskiy, MF; Fahlbusch, J; Kahane-Rapport, SR;

- Oestreich, WK; Bejder, L; Bierlich, KC et al. **Scaling of maneuvering performance in baleen whales: larger whales outperform expectations.** *Journal of Experimental Biology.*
- 2022 Segre, PS; di Clemente, J; Kahane-Rapport, SR; Gough, WT; Meÿer, MA; Lombard, AT; Goldbogen, JA; and GS Penry. High-speed chases along the seafloor put Bryde's whales at risk of entanglement. Conservation Science and Practice.
- 2021 Savoca, MS; Czapanskiy, MF; Kahane-Rapport, SR; Gough, WT; Fahlbusch, J; Bierlich, KC; Segre, PS; di Clemente, J; Penry, GS; Wiley, D et al. **Baleen whale prey consumption based on high resolution foraging measurements.** *Nature.*
- 2021 Gough, WT; Smith, HJ; Savoca, MS; Czapanskiy, MF; Fish, FE; Potvin, J; Bierlich, KC; Cade, DE; di Clemente, J; Kennedy, J; Segre, PS et al. **Scaling of oscillatory kinematics and Froude efficiency in baleen whales.** *Journal of Experimental Biology.*
- 2021 Segre, PS; Weir, CR; Stanworth, A; Cartwright, S; Friedlaender, AS; and JA Goldbogen. Biomechanically distinct filter-feeding behaviors distinguish sei whales as a functional intermediate and ecologically flexible species. *Journal of Experimental Biology.*
- 2021 Czapanskiy, MF; Savoca, MS; Gough, WT; Segre, PS; Wisniewska, DM; Cade, DE; and JA Goldbogen. **Modelling short-term energetic costs of sonar disturbance to cetaceans using high-resolution foraging data.** *Journal of Applied Ecology.*
- 2020 Caruso, F; Hickmot, L; Warren, JD; Segre, PS; Chiang, G; Bahamonde, P; Español-Jiménez, S; Li, S; and A. Bocconcelli. **Diel differences in blue whale (***Balaenoptera musculus***) dive behavior increases nighttime risk of ship strikes in northern Chilean Patagonia.** *Journal of Integrative Zoology.*
- 2020 Dakin, R; Segre, PS; and DL Altshuler. **Individual variability and the biomechanics of maneuvering flight in hummingbirds**. *Journal of Experimental Biology.*
- 2020 Kahane-Rapport, SR; Savoca, MS; Cade, DE; Segre, PS; Bierlich, KC; Calambokidis, JA; Dale, J; Friedlaender, AS; Johnston, DW; Werth, AJ; and JA Goldbogen. **Lunge filter feeding biomechanics constrain rorqual foraging ecology across scale.** *Journal of Experimental Biology.*
- 2020 Segre, PS; Potvin, J; Cade, DE; Calambokidis, J; Di Clemente, J; Fish, FE; Friedlaender, AS; Gough, WT; Kahane-Rapport, SR; Oliveira, C et al. **Energetic and physical limitations on the breaching performance of large whales.** *eLife*.
- 2019 Goldbogen, JA; Cade, DE; Wisniewska, DM; Potvin, J; Segre, PS; Savoca, MS; Hazen, EL; Czapanskiy, MF; Kahane-Rapport, SR; DeRuiter, SL et al. Why whales are big but not bigger: physiological drivers and ecological limits in the age of ocean giants. *Science*.
- 2019 Friedlaender, AS; Bowers, MT; Cade, DE; Hazen, EL; Stimpert, AK; Allen, AN; Calambokidis, J; Fahlbusch, J; Segre, PS; Visser, F et al. **The advantages of diving deep: fin whales double their energy intake by targeting deep krill patches.** *Functional Ecology.*
- 2019 Gough, WT; Segre, PS; Bierlich, KC; Cade, DE; Potvin, J; Fish, FE; Dale, J; di Clemente, J; Friedlaender, AS; Johnston, DW et al. **Scaling of swimming performance in the largest animals.** *Journal of Experimental Biology.*
- 2019 Segre, PS and ED Taylor[†]. Large ants do not carry their fair share: maximal load carrying performance of leaf-cutter ants (*Atta cephalotes*). *Journal of Experimental Biology.*
- 2018 Segre, PS; Cade, DE; Calambokidis, J; Fish, FE; Friedlaender, AS; Potvin, J; and JA Goldbogen. **Body flexibility enhances maneuverability in the world's largest predator.** *Integrative and Comparative Biology.*

- 2018 Segre, PS and Al Banet. The origin of avian flight: finding common ground. Biological Journal of the Linnean Society.
- 2018 Segre, PS; Bocconcelli, A; Hickmott, LS; Howes, G; Warren, JD; and G Chiang. **Offshore hummingbird sightings in Chilean Patagonia.** *Wilson Journal of Ornithology.*
- 2018 Dakin, R*, Segre, PS*, Straw, AD; and DL Altshuler. **Morphology, muscle capacity, skill and maneuvering ability in hummingbirds.** *Science.*
- 2017 Goller, B; Segre, PS; Middleton, KM; Dickinson, MH; and DL Altshuler. **Visual sensory signals dominate tactile cues during docked feeding in hummingbirds.** *Frontiers in Neuroscience.*
- 2017 Saddler, MR; Bocconcelli, A; Hickmott, LS; Chiang, G; Landea-Briones, R; Bahamonde, PA; Howes, G; Segre, PS; and LS Sayigh. Characterizing Chilean blue whale vocalizations with DTAGs: a test of using tag accelerometers for caller identification. *Journal of Experimental Biology.*
- 2017 Skandalis, DA; Segre, PS; Bahlman, JW; Groom, D; Welch Jr; KC; Witt, CC; McGuire, JA; Dudley, R; Lentink, D; and DL Altshuler. Individual performance and the biomechanical origin of extreme wing allometry in hummingbirds. *Nature Communications*.
- 2017 Goldbogen, JA; Cade, DE; Boersma A; Calambokidis, J; Kahane-Rapport, S; Segre, PS; Stimpert, AS; and AS Friedlander. **Using digital tags with integrated video and inertial sensors to study moving morphology and associated behavior in large aquatic vertebrates.** *Anatomical Review.*
- 2017 Segre, PS; Seakamela, SM; Meÿer, MA; Findlay, KP; and JA. Goldbogen. **Flapping flippers: evidence** for a hydrodynamically active flipper-stroke in humpback whales. *Current Biology.*
- 2017 Goldbogen, JA; Cade, DE; Calambokidis, J; Friedlaender, AS; Potvin, J; Segre, PS; and AJ Werth. **How baleen whales feed: the biomechanics of engulfment and filtration.** *Annual Review of Marine Science.*
- 2016 Segre, PS*, Dakin, R*, Read, TJG, and DL Altshuler. **Mechanical constraints on flight at high elevation decrease maneuvering performance.** *Current Biology.*
- 2016 Segre, PS; Cade, DE; Fish, FE; Potvin, J; Allen, AN; Calambokidis, J; Friedlaender, AS; and JA Goldbogen. **Hydrodynamic properties of fin whale flippers predict maximum rolling performance.** *J. of Experimental Biology.*
- 2016 Read, TJG*, Segre, PS*, Middleton, KM; and DL Altshuler. **Hummingbirds control turning velocity** with body orientation and turning radius with asymmetrical wingbeat kinematics. *J. Royal Soc. Interface.*
- 2015 Segre, PS; Dakin, R; Zordan, VB; Dickinson, MH; Straw, AD; and DL Altshuler. **Burst muscle** performance predicts the speed, acceleration, and turning performance of hummingbirds. *eLife*.
- 2015 Altshuler, DL; Bahlman, JW; Dakin, R; Gaede, AH; Goller, B; Lentink, D; Segre, PS; and DA Skandalis. The biophysics of bird flight: functional relationships integrate aerodynamics, morphology, kinematics, muscles and sensors. *Canadian Journal of Zoology.*
- 2012 Pournazeri, S*, Segre, PS*, Princevac, M and DL Altshuler. **Hummingbirds generate bilateral vortex loops during hovering: evidence from flow visualization.** *Experiments in Fluids.*
- 2012 Altshuler, DL; Quicazán-Rubio, EM; Segre, PS and KM Middleton. **Wingbeat kinematics and motor control of yaw turns in Anna's hummingbirds** (*Calypte anna*). *J. of Experimental Biology.*

2009 • Jackson, BE; Dial, KP; and PS Segre. Precocial development of anti-predator locomotor performance in a ground-dwelling bird species (*Alectoris chukar*). Proc. Royal Soc. B.

2008 • Dial, KP; Jackson, BE; and PS Segre. A fundamental avian wing-stroke provides a new perspective on the evolution of flight. *Nature*.

Technical Reports

2022 • Segre, PS and CR Weir. **Chapter 6: Suction cup tagging.** In *Conserving Falkland's whale populations: addressing data deficiencies for informed management* (ed. CR Weir).

Grants Awarded

- 2024 University of Wisconsin Green Bay, Holtz Award Title: Population connectivity and the spread of communicable disease in sharp-shinned hawks Award: \$2000
- 2024 University of Wisconsin Green Bay, Research Council Grant Title: Foraging ecology of Southern right whales on a newly discovered feeding ground in western South Africa Award: \$2900
- 2022 Chico State Affordable Learning Solutions program (CAL\$) Co-Principal Investigator Grant to support adoption of open source and low cost educational materials for introductory biology Award: \$6,487
- 2022 ArcticNet Co-Principal Investigator Title: An ecosystem approach to quantifying behavioural and energetic impacts of anthropogenic disturbance to Arctic whales Award: \$116,330
- 2020 Dalio Foundation/OceanX Principal Investigator Title: Foraging strategies and energetics of inshore South African Bryde's whales: implications for mitigation against lethal entanglement and prey availability Award: \$62,580
- 2019 Science Education Exploration Initiative, Sofar Ocean. Principal Investigator Title: Assessing rorqual whale prey fields with a small underwater ROV Award: \$1,695
- 2018 PADI Foundation Grant for Marine Conservation Collaborator: contributed to project conceptualization and proposal writing Title: Pursuing food and dealing with its cost: a fine-scale study on the foraging ecology of South African inshore Bryde's whales (Balaenoptera edeni) using camera-borne tags Award: \$5,000
- 2017 Society for Marine Mammalogy Collaborator: contributed to project conceptualization and proposal writing Title: Pursuing food and dealing with its cost: a fine-scale study on the foraging ecology of South African inshore Bryde's whales (Balaenoptera edeni) using camera-borne tags Award: \$2,000
- 2017 NSF Division of Integrative Organismal Systems Grant Collaborator: contributed to project conceptualization and proposal writing Title: Scaling of unsteady locomotor performance and maneuverability Award: \$322,907
- 2012 University of British Columbia Hesse Research Award in Ornithology Principal Investigator Title: *The constraints of morphology and reserve power capacities on maneuvering performance in hummingbirds* Award: \$1,485
- 2009 Valentine Eastern Sierra Reserve Graduate Student Grant Principal Investigator Title: The effect of altitudinal gradients on hummingbird performance in two species of hummingbirds Award: \$2,500

2009 • White Mountain Research Station Minigrant • Principal Investigator • Title: *The effects of elevation on maneuverability in two species of hummingbirds* • Award: \$2,000

2009 • NSF Division of Integrative Organismal Systems Grant • Collaborator: contributed to project conceptualization and proposal writing • Title: Computational analysis of maneuvering flight • Award: \$163,173

Grants Awarded to Students

2024 • University of Wisconsin Green Bay, Natural and Applied Sciences Heirloom Grant • to Marissa Helgesen, M.S. student • Title: *Anuran calling behavior in response to traffic noise* • Award: \$1450

2024 • University of Wisconsin Green Bay, Cofrin Center for Biodiversity Student Grant • to Marissa Helgesen, M.S. student • Title: *Anuran calling behavior in response to traffic noise* • Award: \$2500

2024 • University of Wisconsin Green Bay, Graduate Student Research Grant • to Daniel Erickson, M.S. student • Title: Population connectivity and the spread of communicable disease in sharp-shinned hawks • Award: \$1000

Teaching Experience

2023 - Present • University of Wisconsin, Green Bay

BIO 342 • Ornithology

BIO 340 • Comparative Anatomy of the Vertebrates

BCM 700 • Conservation Ecology

BCM 705 • Conservation Research and Management

BCM 725 • Evolution, Biodiversity, and Conservation • co-instructor

2020 - 2023 • California State University, Chico

Advanced Zoology • Lab

Mammalogy

Ornithology

Introduction to living systems

2018 • Organization for Tropical Studies

Research Experience for U.S. Underrepresented Minority Students in Costa Rica

2017 - 2018 • Stanford University

Bio-logging and bio-telemetry • co-instructor

Marine megafauna • co-instructor

2004 - 2015 • Teaching Assistantships

Ecology lab • University of British Columbia

Introductory biology lab • University of California, Riverside

Comparative vertebrate anatomy • University of California, Riverside

Introductory biology lab • University of Montana

Ecology lab • University of Montana

Parasitology lab • University of Montana

Student Supervision

- 2024 Present Daniel Erickson. Masters student. **Population connectivity and the spread of communicable disease in sharp-shinned hawks.** University of Wisconsin, Green Bay
- 2024 Present Jared Ganeles. Masters student. **Impacts of habitat restoration on migratory and resident bird populations.** University of Wisconsin, Green Bay
- 2024 Present Marissa Helgesen. Masters student. **Anuran calling behavior in response to traffic noise.** University of Wisconsin, Green Bay
- 2024 Present Megan Oliva. Undergraduate student. **Mapping noise pollution on the UWGB campus.** University of Wisconsin, Green Bay
- 2024 Present Olivia Castruita. Undergraduate student. **Mapping noise pollution on the UWGB campus.** University of Wisconsin, Green Bay
- 2023 Tiffany Paalman. Undergraduate student. **Environmental determinants of whale barnacle behavior.** University of Wisconsin, Green Bay
- 2023 Present Charlie Giannini. Undergraduate student. **Body condition of saw-whet owls at the Big Chico Creek Ecological Reserve.** California State University, Chico
- 2023 Janae Dugas. Undergraduate student. Whale lice behavior. California State University, Chico
- 2023 Isabelle Fabbro. Undergraduate student. **Jaw muscle allocation in California ground squirrels.** California State University, Chico
- 2022 Masha Elson. Undergraduate student. **Environmental determinants of whale barnacle behavior.** California State University, Chico
- 2018 Ebony Taylor. NSF-LSAMP REU student. **Maximal load carrying performance of Leaf-Cutter Ants** (*Atta cephalotes*). Organization for Tropical Studies, Costa Rica
- 2018 Gabriel Martinez. NSF-LSAMP REU student. **Aerial maneuverability of the Social flycatcher during aerial sallies.** Organization for Tropical Studies, Costa Rica
- 2015 Tyson Read. M.Sc. **Hummingbirds use banking to achieve faster turns and asymmetrical wingstrokes to achieve tighter turns.** University of British Columbia
- 2012 James Whale. B.Sc. Honors Thesis. **Kinematics of bar-headed geese in hypoxia.** University of British Columbia
- 2010 Lev Darkhovsky. CNAS Dean's Summer Research Fellowship. **Morphology and maneuverability in tropical hummingbirds.** University of California, Riverside

2010 • Adam Behroozian. B.Sc. Honors Project. Competitive interactions between male Anna's hummingbirds (*Calypte anna*): understanding the roles of morphology, power margins, and behavior in predicting dominance. University of California, Riverside

Student Advisory Committees

- 2023 Jay Kirkham. Ph.D. North Atlantic right whale foraging ecology. Dalhousie University.
- 2023 Manon den Haan. Ph.D. Bowhead whale foraging ecology. Dalhousie University.
- 2022 Nicholas Balfour. M.Sc. High incubation temperature and thermal stress increase the aerobic performance of juvenile fall-run Chinook salmon (*Oncorhynchus tshawytscha*). California State University, Chico.

Field Expeditions

- Aug 2024, Aug 2023 Bowhead whale foraging ecology. Baffin Island, Canada
- Jan 2023 Southern right whale foraging ecology. South Africa
- Mar 2019 Sei whale foraging ecology and biomechanics. Falkland Islands
- Jun 2018 NSF LSAMP REU program. La Selva Biological Station, Costa Rica
- Apr 2018 Bryde's whale foraging ecology and biomechanics. Plettenberg Bay, South Africa
- Sep 2017 Subarctic whale ecology and biomechanics. Greenland Institute of Natural Resources, Greenland
- Aug 2017, Aug 2018 Rorqual whale maneuverability. Channel Islands and Monterey Bay, California
- Feb 2016, Feb 2017 Patagonia blue whale ecology and biomechanics. Fundacion MERI, Chile
- Sep 2016 Arctic blue whale ecology and biomechanics. Norwegian Polar Institute, Svalbard
- Jun 2013 High elevation Andean hummingbird maneuverability. Hacienda Guaytara, Ecuador
- Feb 2012 High and low elevation tropical hummingbird maneuverability. La Selva Biological Station and Cerro De La Muerte, Costa Rica
- Jul 2010 Amazonian hummingbird maneuverability. Los Amigos Field Station, Peru
- May 2009 High elevation hummingbird maneuverability. Valentine Eastern Sierra Reserve and White Mountain Research Station, California

Awards

- 2015 Pacific Ecology and Evolution Conference Best short talk award, runner up
- 2013 Cooper Ornithological Society Katma Award for unconventional and innovative ideas in ornithology

2011, 2012 • University of British Columbia • Department of Zoology Graduate Fellowship

2008 • University of California, Riverside • Chancellor Distinguished Fellowship

Conferences and Workshops

- 2020 Society Integrative and Comparative Biology: talk presented
- 2018 NSF-LSAMP Diversity and mentoring workshop, Organization for Tropical Studies
- 2018 Teaching workshop for Postdoctoral Scholars, Stanford University
- 2018 Society Integrative and Comparative Biology: talk presented
- 2017 Inertial Sensing Workshop, Kerteminde Denmark
- 2017 Bio-logging Symposium: poster presented
- 2017 Center for Integrated Research Teaching and Learning online course: Introduction to evidence-based undergraduate STEM teaching
- 2016 Society Integrative and Comparative Biology: talk presented
- 2015 Pacific Ecology and Evolution Conference: talk presented
- 2012 Society for Integrative and Comparative Biology: symposium talk co-author
- 2008 Desert Tortoise Research Council
- 2006 Society Integrative and Comparative Biology: poster presented
- 2005 American Ornithologists Union

Invited talks

- Mar 2019 Falkland Conservation Seminar Series, invited speaker
- Sep 2018 Monterey Birding Festival, invited speaker
- Mar 2016 Chico State, biology seminar series
- Oct 2006 Illinois Institute of Technology, biology colloquium series

Work Experience

Feb 2008 • Field Crew Leader, Great Basin Institute: Mojave desert tortoise line distance survey, Nevada

Aug 2007 • Field Technician, Australian Wildlife Conservancy: Purple crowned fairy wren distribution and genetic survey, Mornington Wildlife Research Station, Australia

Mar 2007 • Field Technician, Montana Cooperative Wildlife Research Unit and the University of Montana: long term research of life history variation in tropical birds, Yacumbu, Venezuela

Apr 2004 • Field Technician, United States Geological Survey and University of California at Davis: spotted owl survey in Yosemite National Park

Jan 2004 • Field Intern, Minnesota Department of Natural Resources: Winter population ecology of white tailed deer and gray wolves

Aug 2003 • Field Intern, United States Geological Survey, Hawaii: Biocomplexity of avian disease

May 2003 • Field and Lab Technician, University of Illinois- Smithsonian Institute for Tropical Studies- Barro Colorado Island, Panama: tropical forest soil dynamics

May 2002 • Undergraduate Research Assistant, Illinois Institute of Technology – Biophysics Collaborative Access Team, Argonne National Laboratory: drosophila flight muscle structure

Professional Qualifications

- 2017 Present Remote pilot certification Federal Aviation Administration
- 2009 2017 Federal Bird Banding subpermittee United States Geological Survey
- 2006 Desert Tortoise handling permittee United States Fish and Wildlife Service

Popular Press

- 2024 New York Times: On the wings of war; Jim Robbins
- 2023 Science News Explores: Meet robots on a mission to help birds; Aaron Tremper
- 2023 El Pais: Este es el secreto de los colibríes para encontrar comida y refugio; Veronica M. Garrido
- 2022 Inside JEB: Gargantuan whales more manoeuvrable than they ought to be; Kathryn Knight
- 2021 Nature News and Views: A whale of an appetite revealed by analysis of prey consumption; Victor Smetacek
- 2021 Inside JEB: Versatile sei whales both lunge and skim to feed; Kathryn Knight
- 2020 eLife Insights: Whale breaching says it loud and clear; Alexander J. Werth and Charles L. Lemon
- 2019 Science Perspective: The biology of big; Terrie M. Williams
- 2019 Audubon Magazine: Hummingbird hackers; Jessica Leber
- 2018 Science Perspective: How hummingbirds stay nimble on the wing; Peter C. Wainwright
- 2018 Science: High-speed cameras reveal how hummingbirds can turn on a dime; Elizabeth Pennisi
- 2018 Seeker: The secrets of hummingbird agility revealed; Jen Viegas

- 2017 National Geographic: Rare video captures never-before-seen whale behavior; Carrie Arnold
- 2017 Scientific American Podcast: Humpback whale flippers do more than maneuver; Emily Schwing
- 2017 Science News For Students: Humpbacks flap their flippers like underwater birds; Sharon Oosthoek
- 2017 Sermitsiaq: Forskere: Hvor sulten er en hval i Tasiilaq? (Translation; How hungry are whales in Tasiilaq?); Jorgen Schultz-Nielsen
- 2017 Half Moon Bay Review: Whales taking flight; Sara Hayden
- 2015 Serious Science: Hummingbird agility depends on raw muscle power; Paolo Segre and Roslyn Dakin
- 2010 PBS Documentary: Hummingbirds: Magic in the Air
- 2008 BBC Science News: Secrets of bird flight revealed; Rebecca Morelle

Service as a Reviewer

Journal of Experimental Biology PNAS

Journal of the Royal Society, Interface eLife

Scientific Reports Frontiers in Bioengineering and Biotechnology

Endangered Species Research Behavioral Ecology and Sociobiology

Wilson Journal of Ornithology Marine Mammal Science

Journal of Zoology Methods in Ecology and Evolution

Mammalian Biology Functional Ecology

Behavioral Ecology and Sociobiology