# Curriculum Vitae
# Hal Caswell

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Professor of Mathematical Demography and Ecology
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Born 27 April 1949

B.S. (with high honor), Michigan State University, 1971 (Zoology)
Ph.D., Michigan State University, 1974 (Zoology)

Professor of Mathematical Demography and Ecology, 2013-present, University of Amsterdam
Emeritus Research Scholar, 2014 - present, Woods Hole Oceanographic Institution
Senior Scientist, March 1988-2014, Woods Hole Oceanographic Institution
Associate Scientist, 1981-1988, Woods Hole Oceanographic Institution
Assistant to Associate Professor, 1975-1982, University of Connecticut
Research Associate, 1974-1975, Michigan State University

## Honors and Awards

Advanced Grants from the European Research Council:

- The formal demography of kinship and families (FORMKIN): 2018-2024
- Individual stochasticity and population heterogeneity in plant and animal demography (INDSTOCH): 2013-2018

Editor's Choice award for paper 2021b as one of the best papers in volume 45 of the journal Demographic Research, "in recognition of the rigorous formulation of a dynamic algebraic model of kinship dynamics."

Editor's Choice award for the papers 2019g and 2020c in their respective volumes of the journal Demographic Research, for "pioneering contributions to the formal multistate demography of kinship."

Distinguished Lorentz Fellowship 2019-2020, Netherlands Institute for Advanced Study in the Humanities and Social Sciences.

Rollie Lamberson Medal of the Resource Modeling Association, 2019.

Mindel C. Sheps Award for Mathematical Demography, 2014, Population Association of America

Fellow of Ecological Society of America; Elected 2014 for "distinguished contributions to the discipline"

Vice President and President, Evolutionary Demography Society, 2013-2015.

Honorary Professor of Biodemography, Institute of Biology, Southern Denmark University. 2013-present.

Research Fellowship Award of the Alexander von Humboldt Foundation (Germany) 2011-2012.

Distinguished Brandt Memorial Lecturer, North Carolina State University, March 2009.

Distinguished Research Scholar, Max Planck Institute for Demographic Research, Rostock, Germany 2008 – present.

Recipient of the first Per Brink Oikos Award, presented by the Swedish Oikos Society in February 2008.

US Department of Interior Unit Citation Award for Excellence of Service, International Polar Bear Science Team, 2007.

Recipient of the 2007 Ecological Research Award from the Ecological Society of Japan.

ISI Highly Cited Researcher in Ecology/Environment, Thomson Scientific, 2007.

Certified Senior Ecologist, Ecological Society of America.

Fellow of the Ocean Life Institute, Woods Hole Oceanographic Institution, 2006-2009.

Maclaurin Fellowship, New Zealand Institute of Mathematics and its Applications, 2003.

Fellow of the American Academy of Arts and Sciences; Elected 2000.

Robert W. Morse Chair for Excellence in Oceanography, Woods Hole Oceanographic Institution, 2000 - 2005.

John Simon Guggenheim Memorial Fellowship, 1989-1990.

Fellow of the American Association for the Advancement of Science; Elected 1985,

Winner, 1992 Annual Prize for Best Scientific Paper in Biological Sciences, National Council for Scientific and Technological Investigation (CONICIT), Venezuela.

Vice-Chairman (1995-1996) and Chairman (1996-1997), Theoretical Ecology Section, Ecological Society of America.

Editor, *Advances in Ecological Research,* 2000 – 2007.

Board of Editors, Ecology and Ecological Monographs, 1987-1990.

**Member**: Ecological Society of America; Population Association of America, Evolutionary Demography Society, Dutch Society for Theoretical Biology (NVTB), Netherlands Demographic Society (NVD), Interdisciplinary Association for Population Health Science.

## Visiting and Honorary Appointments

Honorary Professor of Biodemography, University of Southern Denmark, Odense, Denmark. May 2013 – present.

Distinguished Research Scholar, Max Planck Institute for Demographic Research, Rostock, Germany. January 2008 – present.

Mclaurin Fellow, New Zealand Institute of Mathematics and its Applications, University of Auckland, December 2003 – March 2004

Visiting Fellow, Institute for Mathematics and its Applications, University of Minnesota, 1-30 April 1999.

Japan Society for Promotion of Science Invitational Fellowship for Research in Japan, June 1996.

Visiting Fellow, Center for Applied Mathematics, Cornell University, June-July 1993

Visiting Scientist, Laboratory of Theoretical Biology, Department of Biophysics, Kyoto University, Japan. November 1992.

Visiting Lecturer, Estacion Biologica de Donana, Sevilla, Spain, November 1991

Lecturer, Third Autumn Course on Mathematical Ecology, Trieste, Italy, October 1990

Visiting Professor, Dept. of Biology, Universidad de los Andes, Venezuela, September 1989

Distinguished Visiting Professor, Dept. of Biology, University of Miami, February 1989

Science Alliance Visiting Professor of Mathematics and Ecology, University of Tennessee, January-April 1987

Sloan Foundation Distinguished Lecturer in Demography, University of California, Berkeley, March 1986

Visiting Lecturer in Quantitative Ecology, W. K. Kellogg Biological Station, Michigan State University, July 1985

Research Associate, University of California, Berkeley, 1980-1981

Visiting Faculty, OTS 80-3, Tropical Biology, Costa Rica, Summer 1980

Visiting Professor, Washington State University (Pure and Applied Mathematics), May1978

Visiting Lecturer, University of Texas (Zoology), January 1975

## PUBLICATIONS

**Papers submitted:**

a) Alburez-Gutierrez, Diego, Nicola Barban, **Hal Caswell**, Martin Kolk, Rachel Margolis, Emily Smith-Greenaway, Xi Song, et al. Kinship, demography, and inequality: Review and key areas for future development.

b) Zarulli, V. and **H. Caswell.** Longer healthy life, but for how many? Insights on healthy lifespan inequality from the Global Burden of Disease Study.

c) Jiang, S., Wenyun Zuo, Zhen Guo, **Hal Caswell,** and Shripad Tuljapurkar. How does the demographic transition affect kinship networks?

**Papers in press:**

a) van Daalen, S. F. and **H. Caswell**. Demographic sources of variance in fitness. To appear in *Human Evolutionary Demography,* ed. Rebecca Sear, Oskar Burger, and Ronald Lee. Open Book Publishers (in press) https://osf.io/p59eu/

**Preprints (reverse chronological order):**

a) Alburez-Gutierrez, Diego, Nicola Barban, **Hal Caswell**, Martin Kolk, Rachel Margolis, Emily Smith-Greenaway, Xi Song, et al. 2022. "Kinship, Demography, and Inequality: Review and Key Areas for Future Development." SocArXiv. June 18. https://doi.org/10.31235/osf.io/fk7x9

b) Varas-Enriquez, P.J., S. van Daalen, and **H. Caswell**. 2022. Individual stochasticity in the life history strategies of animals and plants. bioRxiv preprint https://doi.org/10.1101/2022.03.06.483187

c) **Caswell, H.** 2022. The formal demography of kinship IV: Two-sex models. bioRxiv preprint https://doi.org/10.1101/2022.01.17.476606

d) Zarulli, V. and **H. Caswell**. 2022. Longer healthy life, but for how many? Insights on healthy lifespan inequality from the Global Burden of Disease Study. medRxiv preprint. https://doi.org/10.1101/2022.12.06.22283153

e) **Caswell, H.** and S.F. van Daalen. 2021. Healthy longevity from incidence-based models: More kinds of health than stars in the sky. medRxiv preprint https://doi.org/10.1101/2021.04.16.21255628

f) **Caswell, H.** and X. Song. 2021. The formal demography of kinship III: Kinship dynamics with time-varying demographic rates. bioRxiv preprint https://doi.org/10.1101/2021.03.15.435377

g) **Caswell, H**. 2020. The formal demography of kinship II: Multistate models, parity, and sibship. bioRxiv preprint https://doi.org/10.1101/2020.03.23.00384

h) Hernandez, C. M., S.F. van Daalen, **H. Caswell**, M.G. Neubert, and K.E. Gribble. 2019. Maternal effect senescence and fitness: A demographic analysis of a novel model organism. bioRxiv preprint http://dx.doi.org/10.1101/847640.

i) Jenouvrier, S., L. Aubrey, S. F. van Daalen, C. Barbraud, H. Weimerskirch, and **H. Caswell**. 2019. When the going gets tough, the tough get going: effect of extreme climate on an Antarctic seabird's life history. bioRxiv preprint. http://dx.doi.org/10.1101/791855

**Books:**

2019. **Caswell, H.** *Sensitivity Analysis: Matrix Methods in Demography and Ecology.* Demographic Research Monographs. Springer Nature.

2005a. Keyfitz, N. and **H. Caswell**. *Applied Mathematical Demography.* Third edition. Springer-Verlag, New York, NY. 555pp.

2005f. **Caswell, H.** (ed.) *Food Webs: From Connectivity to Energetics.* Advances in Ecological Research 36. Elsevier Academic Press, San Diego, California. 194pp.

2001a. **Caswell, H.** *Matrix Population Models: Construction, Analysis, and Interpretation.* Second edition. Sinauer Associates, Sunderland MA. 722pp.

1997a. Tuljapurkar, S. and **H. Caswell** (eds.). *Structured Population Models in Marine, Terrestrial and Freshwater Systems*. Chapman and Hall, New York. 643pp.

1989a **Caswell, H.** *Matrix Population Models: Construction, Analysis, and Interpretation.* Sinauer Associates, Sunderland, MA. 328 pp.

**All publications, reverse chronological order:**

2022a. van Daalen, S.F., C.M. Hernandez, **H. Caswell,** M.G. Neubert, and K.E. Gribble. 2022. The contribution of maternal age heterogeneity to variance in lifetime reproductive output. American Naturalist 199(5): online. http://doi.org/10.1086/718716

2022b. Sun, R., C. Barbraud, H. Weimerskirch, K. DeLord, S.C. Patrick, **H. Caswell**, and S. Jenouvrier. Causes and consequences of pair-bond disruption in a sex-skewed population of a long-lived monogamous seabird. Ecological Monographs 2022 e1522. https://doi.org/10.1002/ecm.1522

2022c. Song, X. and **H. Caswell**. The role of kinship in racial differences in exposure to unemployment. Demography 59:1325-1352. https://doi.org/10.1215/00703370-10057831

2022d. Jenouvrier, S., L. Aubrey, S. F. van Daalen, C. Barbraud, H. Weimerskirch, and H. Caswell. 2022. When the going gets tough, the tough get going: effect of extreme climate on an Antarctic seabird's life history. Ecology Letters 25:2120- 2131. https://doi.org/10.1111/ele.14076

2022e. Caswell, H. 2022. The formal demography of kinship IV: Two-sex models and their approximations. Demographic Research 47:359-396. https://doi.org/10.4054/DemRes.2022.47.13

2022f. Ebeling, M., E. Acosta, **H. Caswell**, A.C. Meyer, and K. Modig. 2022, Years of life lost during the Covid-19 pandemic in Sweden considering variation in life expectancy by level of geriatric care. European Journal of Epidemiology (published online). https://doi.org/10.1007/s10654-022-00915-z

2022g. Varas-Enriquez, P.J., S. van Daalen, and H. Caswell. 2022. Individual stochasticity in the life history strategies of animals and plants. PLoS ONE 17(9): e0273407. https://doi.org/10.1371/journal.pone.0273407

2021a. **Caswell, H.** and S. F. van Daalen. Healthy longevity from incidence-based models: More kinds of health than stars in the sky. Demographic Research 45:397-452.

2021b. **Caswell, H.** and X. Song. The formal demography of kinship III. Kinship dynamics with time-varying demographic rates. Demographic Research 45:517-546.

2021c. Vindenes, Y., C. Le Couer, and **H. Caswell.** Introduction to matrix population models. In *Demographic Methods Across the Tree of Life*, ed. R. Salguero-Gomez and M. Gamelon. Oxford University Press, Oxford, UK.

2021d. Rémi Fay, Matthieu Authier, Sandra Hamel, Stéphanie Jenouvrier, Martijn van de Pol, Emmanuelle Cam, Jean-Michel Gaillard, Nigel G. Yoccoz, Paul Acker, Andrew Allen, Lise M. Aubry, ChristopheBonenfant, **Hal Caswell**, ChristopheF.D.Coste, BenjaminLarue, Christie Le Coeur, Marlène Gamelon, Kaitlin R. Macdonald, Maria Moiron, Alex Nicol-Harper, Fanie Pelletier,| Jay J. Rotella, Celine Teplitsky, Laura Touzot, Caitlin P. Wells, Bernt-Erik Sæther. 2021. Quantifying fixed individual heterogeneity in demographic parameters: Performance of correlated random effects for Bernoulli variables. Methods in Ecology and Evolution 000:1-14.

2020a. van Daalen, S.F. and **H. Caswell**. Variance as a life history outcome: Sensitivity analysis of the contributions of stochasticity and heterogeneity. Ecological Modelling 417: 108856. https://doi.org/10.1016/j.ecolmodel.2019.108856

2020b. de Vries, C., R. A. Desharnais, and **H. Caswell**. A matrix model for density-dependent selection in stage-classified populations, with application to pesticide resistance in *Tribolium*. Ecological Modelling 416:108875 https://doi.org/10.1016/ j.ecolmodel.2019.108875

2020c. **Caswell, H**. The formal demography of kinship II: Multistate models, parity, and sibship. Demographic Research 42: 1097-1144. DOI: 10.4054/DemRes.2020.42.38 [Editor's Choice award from Demographic Research]

2020d. Hernandez, C.M., S.F. van Daalen, **H. Caswell**, M.G. Neubert, and K.E. Gribble. A demographic and evolutionary analysis of maternal effect senescence. Proceedings of the National Academy of Sciences USA. 117 (28) 16431-16437. www.pnas.org/cgi/doi/10.1073/pnas.1919988117

2019a. Ackleh, A., **H. Caswell**, R. Chiquet, T. Tang, and A. Veprauskas. Sensitivity analysis of the recovery time for a population under the impact of an environmental disturbance. Natural Resource Modeling 32:e12166. doi: 10.1111/nrm.12166

2019b. de Vries, C. and **H. Caswell.** Stage-structured evolutionary demography: linking life histories, population genetics, and ecological dynamics. American Naturalist 193:545-559.

2019c. Reimer, J. R., **Caswell, H**., Derocher, A. E., Lewis, M. A. Ringed seal demography in a changing climate. Ecological Applications. Online e01855

2019d. Seaman, R., T. Riffe, and **H. Caswell**. The changing contribution of area-level deprivation to total variance in age at death: A population-based decomposition analysis. BMJ Open 9:e024952

2019e. **Caswell, H.** *Sensitivity Analysis: Matrix Methods in Demography and Ecology.* Demographic Research Monographs. Springer Nature.

2019f. de Vries, C. and **H. Caswell**. Selection in two-sex stage-structured populations: genetics, demography, and polymorphism. Theoretical Population Biology 130:160-169. https://doi.org/10.1016/j.tpb.2019.07.012.

2019g. **Caswell, H**. The formal demography of kinship: A matrix formulation. Demographic Research 41:679-712. **[**Editor's Choice award from Demographic Research]

2019h. Jenouvrier S., Holland, M., Iles, D., Labrousse, S., Landrum, L., Garnier, J., **Caswell, H.**, Weimerskirch, H., LaRue, M., Ji, R., Barbraud, C. The Paris Agreement objectives will likely halt future declines of emperor penguins. Global Change Biology 00:1-15. DOI 10.1111/gcb.14864

2018a. Roth, G. and **H. Caswell**. Occupancy time in sets of states for demographic models. Theoretical Population Biology 120:62-77.

2018b. Needham, J., C. Merow, C-H. Chang-Yang, **H. Caswell**, and S. McMahon. A cross-scale demographic approach to forest dynamics. Proceedings of the Royal Society B (online) doi: 10.1098/rspb.2017.2050

2018c. Jenouvrier, S., L. Aubry, C. Barbraud, H. Weimerskirch, and **H. Caswell**. Interacting effects of unobserved heterogeneity and individual stochasticity in the life history of

the southern fulmar. Journal of Animal Ecology 87:212-222. DOI: 10.1111/1365-2656.12752.

2018d. Shyu, E. and **H. Caswell**. Matings, births, and transitions: a new two-sex matrix model for evolutionary demography. Population Ecology 60:21-36.

2018e. Hartemink, N. and **H. Caswell**. Variance in animal longevity: contributions of heterogeneity and stochasticity. Population Ecology 60:89-99.

2018f. **Caswell, H**. and V. Zarulli. Matrix methods in health demography: a new approach to the stochastic analysis of healthy longevity and DALYs. Population Health Metrics 16:8 doi.org/10.1186/s12963-018-0165-5

2018g. **Caswell, H**. and Y. Vindenes. Demographic variance in heterogeneous populations: Matrix models and sensitivity analysis. Oikos 127:648-663.

2018h. Hamel, S., Gaillard, J-M, Yoccoz, N. G., Bassar, R., Bouwhuis, S, **Caswell, H**., Douhard, M., Gangloff, E., Gimenez, O., Lee, P., Smallegange, I. M., Steiner, U., Vedder, O., and Vindenes, Y. Moving forward on individual heterogeneity. Oikos 127:750-756.

2018i. Jenouvrier, S. M. Desprez, R. Fay, C. Barbraud, H. Weimerskirch, K. Delord, and **H. Caswell**. Climate change and functional traits impact population dynamics of a long-lived seabird. Journal of Animal Ecology 87:906-920. DOI: 10.1111/1365-2656.12827

2018j. **Caswell, H**., C. de Vries, N. Hartemink, G. Roth, and S. F. van Daalen. Age x stage-classified demography: a comprehensive approach. Ecological Monographs 88:560-584.

2018k. de Vries, C. and **H. Caswell**. Demography when history matters: construction and analysis of second-order matrix population models. Theoretical Ecology 11:129-140.

2017a. Hartemink, N., T.I. Missov, and **H. Caswell**. Stochasticity, heterogeneity, and variance in longevity in human populations. Theoretical Population Biology 114:107-117.

2017b. Oli, M., J. Loughry, **H. Caswell**, C. Perez-Heydrich, C. McDonough, and R. Truman. Dynamics of leprosy in Nine-Banded Armadillos: Net reproductive number and effects on host population dynamics. Ecological Modelling 350:100-108.

2017c. **Caswell, H.** and E. Shyu. Senescence, selection gradients, and mortality. pp. 56-82 in *The Evolution of Senescence in the Tree of Life*. R.P. Shefferson, O.R. Jones, and R. Salguero-Gomez (editors). Cambridge University Press, Cambridge, UK.

2017d. van Daalen, S. F. and **H. Caswell**. 2017. Lifetime reproductive output: individual stochasticity, variance, and sensitivity analysis. Theoretical Ecology. 10:355-374.

2017e. Ackleh, A., R.A. Chiquet, B. Ma, T. Tang, **H. Caswell**, and N. Sidorovskaia. Analysis of the impact of environmental disasters on sperm whales using stochastic modeling. Ecotoxicology 26:820-830.

2017f. Smallegange, I., **H. Caswell**, M.E.M. Toorians, and A.M. de Roos. Mechanistic description of population dynamics using dynamic energy budget theory incorporated into integral projection models. Methods in Ecology and Evolution 8:146-154.

2017g. Wensink, M. J., **H. Caswell**, and A. Baudisch. The rarity of survival to old age does not drive the evolution of senescence. Evolutionary Biology 44:5-10. DOI 10.1007/s11692-016-9385-4

2016a. Salguero-Gomez, R., 20 co-authors, **H. Caswell***, and J.W. Vaupel*. [*=joint senior authors]. COMADRE: A global database of animal demography. Journal of Animal Ecology 85:371-384.

2016b. Shyu, E. and **H. Caswell**. A demographic model for sex ratio evolution and the effects of sex-biased offspring costs. Ecology and Evolution 6:1470-1492. doi: 10.1002/ece3.1902

2016c. Shyu, E. and **H. Caswell**. Frequency-dependent two-sex models: a new approach to sex ratio evolution with multiple maternal conditions. Ecology and Evolution 6:6855-6879. doi: 10.1002/ece3.2202

2016d. Koons, D.N., D.T. Iles, M. Schaub, and **H. Caswell**. A life history perspective on the demographic drivers of structured population dynamics in changing environments. Ecology Letters 19:1023-1031.

2016e. Roth, G. and **H. Caswell**. Hyperstate matrix models: extending demographic state spaces to higher dimensions. Methods in Ecology and Evolution 7:1438-1450. doi: 10.1111/2041-210X.12622

2016f. **Caswell, H**. and S. van Daalen. A note on the vec operator applied to unbalanced block matrices. Journal of Applied Mathematics (online) Volume 2016, Article ID 4590817. doi 10.1155/2016/4590817

2015a. **Caswell, H.** and F. A. Kluge. Demography and the statistics of lifetime economic transfers under individual stochasticity. Demographic Research 32:563-588.

2015b. Salguero-Gomez, R., **H. Caswell**, and 33 co-authors. The COMPADRE Plant Matrix Database: an open online repository for plant demography. Journal of Ecology 103:202-218.

2015c. van Daalen, S. and **H. Caswell**. Lifetime reproduction and the second demographic transition: Stochasticity and individual variation. Demographic Research 33:561-588.

2015d. **Caswell, H**. and N. Sanchez Gassen. The sensitivity analysis of population projections. Demographic Research 33:801-840.

2014a. Jones, O., A. Scheuerlein, R. Salguero-Gomez, C.G. Camarda, R. Schaible, B. Casper, J.P. Dahlgren, J. Ehrlen, M.B. Garcia, E. Menges, P.F. Quintana-Ascencio, **H. Caswell,** A. Baudisch, and J. Vaupel. Diversity of aging across the tree of life. Nature 505:169-173. (published online 2013).

2014b. Engelman, M., **H. Caswell**, and E. M. Agree. Why do lifespan variability trends for the young and old diverge? A perturbation analysis. Demographic Research 48:1367-1396.

2014c. Shyu, E. and **H. Caswell.** Calculating second derivatives of population growth rates for ecology and evolution. Methods in Ecology and Evolution 5:473-482.

2014d. Jenouvrier, S., M. Holland, J. Stroeve, M. Serreze, C. Barbraud, H. Weimerskirch, and **H. Caswell.** Climate change and continent-wide declines of the emperor penguin. Nature Climate Change 4:715-718. doi:10.1038/nclimate2280.

2014e. **Caswell, H.** A matrix approach to the statistics of longevity in heterogeneous frailty models. Demographic Research 31:553-592. doi: 10.4054/DemRes.2014.31.19

2013a. **Caswell, H**. Sensitivity analysis of discrete Markov chains via matrix calculus. Linear Algebra and its Applications 438:1727-1745. doi:10.1016/j.laa.2011.07.046 (published online 2011).

2013b. **Caswell, H.** and R. Salguero-Gomez. Age, stage, and senescence in plants. Journal of Ecology 101:585-595. doi: 10.1111/1365-2745.12088

2013c. van Raalte, A. and **H. Caswell.** Perturbation analysis of indices of lifespan variability. Demography 50:1615--1640.

2013d. Shyu, E., E. Pardini, T. Knight, and **H. Caswell**. A seasonal, density-dependent model for the management of an invasive weed. Ecological Applications 23:1893-1905.

2012a. Jenouvrier, S., M. Holland, J. Strœve, C. Barbraud, H. Weimerskirch, M. Serreze, and **H. Caswell.** Effects of climate change on an emperor penguin population: analysis of coupled demographic and climate models. Global Change Biology 18:2756-2770. doi: 10.1111/j.1365-2486.2012.02744.x.

2012b. **Caswell, H.** and E. Shyu. Sensitivity analysis of periodic matrix population models. Theoretical Population Biology. 82:329-339.

2012c. **Caswell, H.** Matrix models and sensitivity analysis of populations classified by age and stage: a vec-permutation matrix approach. Theoretical Ecology 5:403-417. DOI 10.1007/s12080-011-0132-2 (published online 2011)

2012d. Strasser, C.A., M.G. Neubert, **H. Caswell**, and C.M. Hunter. Contributions of high and low quality patches to a metapopulation with stochastic disturbance. Theoretical Ecology 5:167-179l. doi 10.1007/s12080-010-0106-9 (published online 2010).

2011a. **Caswell, H.** Beyond $R_0$: Demographic calculation of variability in lifetime reproductive output. PLoS ONE 6(6): e20809. doi:10.1371/journal. pone.0020809

2011b. **Caswell, H**. Perturbation analysis of continuous-time absorbing Markov chains. Numerical Linear Algebra with Applications 18:901-917. doi:10.1002/nla.791

2011c. Klepac, P. and **H. Caswell**. The stage-structured epidemic: a multi-state matrix population model approach. Theoretical Ecology 4:301-319 (published online 2010).

2011d. **Caswell, H.**, M.G. Neubert and C.M. Hunter. Demography and dispersal: invasion speeds and sensitivity analysis in periodic and stochastic environments. Theoretical Ecology 4:407-421. DOI 10.1007/s12080-010-0091-z (published online 2010).

2010a. **Caswell, H.** Life table response experiment analysis of the stochastic growth rate. Journal of Ecology 98:324-333.

2010b. Jenouvrier, S., **H. Caswell**, C. Barbraud, and H. Weimerskirch. Mating behavior, population growth and the operational sex ratio: a periodic two-sex model approach. American Naturalist 175:739-752.

2010c. **Caswell, H.** Reproductive value, the stable stage distribution, and the sensitivity of the population growth rate to changes in vital rates. Demographic Research 23:531-548. DOI:10.4054/DemRes.2010.23.19

2010d. Hunter, C.M., **H. Caswell**, M.C. Runge, E.V. Regehr, S.C. Amstrup, and I. Stirling. Climate change threatens polar bear populations: a stochastic demographic analysis. Ecology 91:2883-2898.

2010e. Cooch, E.G., E. Cam, and **H. Caswell.** Incorporating `recruitment' in matrix projection models: estimation, parameters, and the influence of model structure. Journal of Ornithology DOI 10.1007/s10336-010-0573-1

2009a. Hunter, C.M. and **H. Caswell.** Rank and redundancy of multistate mark-recapture models for seabird populations with unobservable states. Modeling Demographic Processes in Marked Populations. D. Thomson, E.G. Cooch, and M.J. Conroy (editors). Ecological and Environmental Statistics 3:797-825.

2009b. Knight, T., **H. Caswell**, and S. Kalisz. Population growth rate of a common understory herb decreases non-linearly across a gradient of deer herbivory. Forest Ecology and Management 257:1095-1103.

2009c. Jenouvrier, S., **H. Caswell**, C. Barbraud, M. Holland, J. Stroeve, and H. Weimerskirch. Demographic models and IPCC climate projections predict the decline of an emperor penguin population. Proceedings of the National Academy of Sciences 106:1844-1847.

2009d. Aberg, P., C.J. Svensson, **H. Caswell**, and H. Pavia. Environment-specific elasticity and sensitivity analysis of the stochastic growth rate. Ecological Modelling 220:605-610.

2009e. **Caswell, H.** Sensitivity and elasticity of density-dependent population models. Journal of Difference Equations and Applications 15:349-369.

2009f. Lawler, R.L., **H. Caswell**, A.F. Richard, J. Ratsirarson, R.E. Dewar, and M. Schwartz. Population dynamics of Verreaux's sifaka in a stochastic rainfall environment. Oecologia 161:491-504.

2009g. Amstrup, S.C., **H. Caswell,** E. DeWeaver, I. Stirling, D.C. Douglas, B.G. Marcot, and C.M. Hunter. Rebuttal of "Polar bear population forecasts: a public-policy forecasting audit." Interfaces 39:353-369.

2009h. Jenouvrier, S., C. Barbraud, H. Weimerskirch, and **H. Caswell**. Limitation of population recovery: a stochastic approach to the case of the emperor penguin. Oikos 118:1298-1298.

2009i. Neubert, M.G., **H. Caswell**, and A.R. Solow. Detecting reactivity. Ecology 90:2683-2688.

2009j. Regehr, E.V., C.M. Hunter, **H. Caswell**, S.C. Amstrup, and I. Stirling. Survival and breeding of polar bears in the southern Beaufort Sea in relation to sea ice. Journal of Animal Ecology doi: 10.1111/j.1365-2656.2009.01603.x

2009k. **Caswell, H.** Stage, age, and individual stochasticity in demography. The Per Brinck Oikos Award Lecture 2008. Oikos 118:1763-1782.

2008a. Ripley, B.D. and **H. Caswell**. Contributions of growth, survival, and reproduction to fitness in brooding and broadcast spawning marine bivalves. Population Ecology 50:207-214.

2008b. **Caswell, H.** Perturbation analysis of nonlinear matrix population models. Demographic Research 18:59-116.

2008c. Verdy, A. and **H. Caswell.** Sensitivity analysis of reactive ecological dynamics. Bulletin of Mathematical Biology 70:1634-1659.

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