Curriculum Vitae

HAL CASWELL **April 13, 2012**

Senior Scientist

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Distinguished Research Scholar
Max Planck Institute for Demographic Research
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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)

Senior Scientist, March 1988-present, 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

Alexander von Humboldt Foundation Research Award, 2010.

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

Certified Senior Ecologist, Ecological Society of America.

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.

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, "For contributions to theoretical ecology, including design of nonequi librium models and analysis of complex life cycles."

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; American Association for the Advancement of Science; Population Association of America.

Visiting Appointments

Affiliate Faculty Member, Department of Biology and Wildlife, University of Alaska Fairbanks. June 2008 – present.
Distinguished Research Scholar, Max Planck Institute for Demographic Research, Rostock, Germany. January 2008 – present.
Guest Researcher, Max Planck Institute for Demographic Research, Rostock, Germany. January-February 2007
Guest Researcher, Max Planck Institute for Demographic Research, Rostock, Germany. November – December 2005
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), May 1978
Visiting Lecturer, University of Texas (Zoology), January 1975

PUBLICATIONS

Submitted:

a) van Raalte, A. and **H. Caswell.** Perturbation analysis of indices of lifespan variability.

In Press:

a) **Caswell, H.** and E. Shyu. Sensitivity analysis of periodic matrix population models. Theoretical Population Biology (in press).

b) 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 (in press).

Books:

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:

2011a. **Caswell, H.** Matrix models and sensitivity analysis of populations classified by age and stage: a vec-permutation matrix approach. Theoretical Ecology. DOI 10.1007/s12080-011-0132-2

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

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

2011d. **Caswell, H**. Sensitivity analysis of discrete Markov chains via matrix calculus. Linear Algebra and its Applications. doi:10.1016/j.laa.2011.07.046

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. Klepac, P. and **H. Caswell**. The stage-structured epidemic: a multi-state matrix population model approach. Theoretical Ecology DOI: 10.1007/s12080-010-0079-8

2010d. **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

2010e. **Caswell, H.**, M.G. Neubert and C.M. Hunter. Demography and dispersal: invasion speeds and sensitivity analysis in periodic and stochastic environments. Theoretical Ecology. DOI 10.1007/s12080-010-0091-z

2010f. 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.

2010g. 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

2010h. 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 DOI 10.1007/s12080-010-0106-9

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.

2007a. **Caswell, H.** Sensitivity analysis of transient population dynamics. Ecology Letters 10:1-15.

2007b. Chen, J., D. Senturk, J.L. Wang, H.G. Muller, J.R. Carey, **H. Caswell**, and E.P. Caswell-Chen. A demographic analysis of the fitness cost of extended longevity in *Caenorhabditis elegans*. Journal of Gerontology: Biological Sciences 62A:126-135.

2007c. **Caswell, H.** Extrinsic mortality and the evolution of senescence. Trends in Ecology and Evolution 22:173-174.

2007d. **Caswell, H**. Evolutionary demography: the invasion exponent and the effective population density in nonlinear matrix models. pp. 237-256 in N. Rooney, K.S. McCann and D. L.G. Noakes (eds.) *From energetics to ecosystems: the dynamics and structure of ecological systems*. Springer, Dortrecht.

2007e. Regehr, E.V., C.M. Hunter, **H. Caswell,** S.C. Amstrup, and I. Stirling. Polar bears in the southern Beaufort Sea I: Survival and breeding in relation to declining sea ice, 2001-2006. U.S. Geological Survey Administrative Report (peer-reviewed and publicly released; http://www.usgs.gov/newsroom/special/polar_bears/docs/regehr.pdf). 50 pp.

2007f. Hunter, C.M., **H. Caswell**, M.C. Runge, E.V. Regehr, S.C. Amstrup, and I. Stirling. Polar bears in the southern Beaufort Sea II: Demography and population growth in relation to sea ice conditions. U.S. Geological Survey Administrative Report (peer-reviewed and publicly released; http://www.usgs.gov/newsroom/special/polar_bears/docs/hunter.pdf). 51 pp.

2007g. Klanjscek, T., R.M. Nisbet, **H. Caswell**, and M.G. Neubert. A model for energetics and accumulation in marine mammals with application to the right whale. Ecological Applications 17:2233-2250.

2006a. Ripley, B.J. and **H. Caswell**. Recruitment variability and stochastic population growth of the soft-shell clam *Mya arenaria*. Ecological Modelling 193:517-530.

2006b. Kawasaki, K., F. Takasu, **H. Caswell**, and N. Shigesada. How does stochasticity in colonization accelerate the speed of invasion in a cellular automaton model? Ecological Research 21:334-345.

2006c. Lewis, M.A., M.G. Neubert., **H. Caswell**, J.S. Clark, and K. Shea. A guide to calculating discrete-time invasion rates from data. pp. 169-192 in M.W. Cadotte, S.M. McMahon, and T. Fukami (editors), *Conceptual ecology and invasion biology: reciprocal approaches to nature*. Springer, Dordrecht, Netherlands.

2006e. Fujiwara, M., K. Anderson, M.G. Neubert, and **H. Caswell**. On the estimation of dispersal kernels from individual mark-recapture data. Environmental and Ecological Statistics 13:183-197.

2006f. Klanjscek, T., **H. Caswell**, M.G. Neubert, and R.M. Nisbet. Integrating dynamic energy budget models into matrix population models. Ecological Modelling 196:407-420.

2006g. Chen, J., E.E. Lewis, J.R. Carey, **H. Caswell**, and E. P. Caswell-Chen. The ecology and biodemography of *Caenorhabditis elegans*. Experimental Gerontology 41:1059-1065.

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

2005b. **Caswell, H.** Sensitivity analysis of the stochastic growth rate: three extensions. Australian and New Zealand Journal of Statistics 47:75-85.

2005c. Smith, M., **H. Caswell**, and P. Mettler-Cherry. Stochastic flood and precipitation regimes and the population dynamics of a threatened floodplain plant. Ecological Applications 15:1036-1052.

2005d. **Caswell, H.** and M. Neubert. Reactivity and transient dynamics of discrete-time ecological systems. Journal of Difference Equations and Applications 11:295-310.

2005e. Hunter, C.M. and **H. Caswell**. Selective harvest of sooty shearwater chicks: effects on population dynamics and sensitivity. Journal of Animal Ecology 74:589-600.

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

2005g. Kraus, S.D., M.W. Brown, **H. Caswell**, C.W. Clark, M. Fujiwara, P.K. Hamilton, R. D. Kenney, A.R. Knowlton, S. Landry, C.A. Mayo, W.A. McLellan, M.J. Moore, D.P. Nowacek, D. A. Pabst, A.J. Read, R.M. Rolland. North Atlantic right whales in crisis. Science 309:561-562.

2005h. Hunter, C.M. and **H. Caswell**. The use of the vec-permutation matrix in spatial matrix population models. Ecological Modelling 188:15-21.

2004a. Freville, H., B. Colas, M. Riba, **H. Caswell**, A. Mignot, E. Imbert, and I. Olivieri. Spatial and temporal demographic variability in the endemic plant species *Centaurea corymbosa* (Asteraceae). Ecology 85:694-703.

2004b. **Caswell, H.**, T. Takada, and C.M. Hunter. Sensitivity analysis of equilibrium in density-dependent matrix population models. Ecology Letters 7:380-387.

2004c. **Caswell, H.** and T. Takada. Elasticity analysis of density-dependent matrix population models: the invasion exponent and its substitutes. Theoretical Population Biology 65:401-411.

2004d. Hill, M.F., J.D. Witman, and **H. Caswell**. A Markov chain model of a rocky subtidal community: succession and species interactions in a complex assemblage. American Naturalist 164:E46-E61.

2004e. Neubert, M.G., T. Klanjscek, and **H. Caswell**. Reactivity and transient dynamics of food web and predator-prey models. Ecological Modelling 179:29-38.

2004f. **Caswell, H.** and M. Fujiwara. Beyond survival estimation: mark-recapture, matrix population models, and population dynamics. Animal Biodiversity and Conservation 27:471-488.

2003a**.** Lesnoff, M., P. Ezanno, and **H. Caswell**. Sensitivity analysis in periodic matrix models: a postscript to Caswell and Trevisan. Applied Mathematics Letters: Mathematical and Computer Modelling 37:945-948.

2003b. **Caswell, H.**, R. Lensink, and M. G. Neubert. Demography and dispersal: comparing invasion speeds using Life Table Response Experiments. Ecology 84:1968-1978.

2003c. **Caswell, H**. Review of Kot, M. *Elements of mathematical ecology*. 2001. Cambridge University Press. Quarterly Review of Biology 78:251-252.

2003d. **Caswell, H.** Models, experiments, and chaos. A review of Cushing, J.M., R.F. Costantino, B. Dennis, R.A. Desharnais, and S.M. Henson. 2003. *Chaos in ecology*. Academic Press. Ecology 84:2804-2805.

2002a. **Caswell, H.** Matrix population models. Encyclopedia of Environmetrics 3:1228-1229. Wiley, New York.

2002b. Neubert, M.G., **H. Caswell**, and J.D. Murray. Transient dynamics and pattern formation: reactivity is necessary for Turing instability. Mathematical Biosciences 175:1-11.

2002c. Bullock, J.M., I.L. Moy, R.F. Pywell, S.J. Coulson, A.M. Nolan, and **H. Caswell**. Plant dispersal and colonization processes at local and landscape scales. pp. 279-302 in J.M. Bullock , R. Kenward, and R. Hailes (eds.) Dispersal Ecology. Blackwell, Oxford, United Kingdom.

2002d. Hill, M.F., J.D. Witman and **H. Caswell**. Spatio-temporal variation in Markov chain models of subtidal community succession. Ecology Letters 5:665-675.

2002e. Harding, K.C., T. Harkonen, and **H. Caswell**. The 2002 European seal plague: epidemiology and population consequences. Ecology Letters 5:727-732.

2002f. Fujiwara, M. and **H. Caswell**. Estimating population projection matrices from multi-stage mark-recapture data. Ecology 83:3257-3265

2002g. Fujiwara, M. and **H. Caswell**. A general approach to temporary emigration in mark-recapture analysis. Ecology 83:3266–3275

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

2001b. Hill, M.F. and **H. Caswell**. The effects of habitat destruction in finite landscapes: a chain-binomial metapopulation model. Oikos 93:321-331.

2001c. **Caswell, H.** and T. Kaye. Stochastic demography and conservation of *Lomatium bradshawii* in a dynamic fire regime. Advances in Ecological Research 32:1-51

2001d. **Caswell, H.** Remarks on behalf of Biological Sciences, Induction Ceremony, American Academy of Arts and Sciences. Bulletin of the American Academy of Arts and Sciences 54:47-52 (Winter 2001).

2001e. Fujiwara, M. and **H. Caswell**. Demography of the endangered North Atlantic right whale. Nature 414:537-541.

2000a**. Caswell, H.** Prospective and retrospective perturbation analyses and their use in conservation biology. Ecology 81:619-627.

2000b. Heppell, S.S., **H. Caswell**, and L.B. Crowder. Life histories and elasticity patterns: perturbation analysis for species with minimal demographic data. Ecology 81:654-665.

2000c. **Caswell, H.**, S. Brault, J.-D. Lebreton, M. Neubert, R. Sibly, T. Takada, and S. Tuljapurkar. No inconsistencies in sensitivity analysis. Trends in Ecology and Evolution 15:204.

2000d. Neubert, M.G. and **H. Caswell**. Demography and dispersal: calculation and sensitivity analysis of invasion speed for structured populations. Ecology 81:1613-1628.

2000e. Neubert, M.G. and **H. Caswell**. Density-dependent vital rates and their population dynamic consequences. Journal of Mathematical Biology 43:103-121.

2000f. **Caswell, H.** Life table response experiments in ecotoxicology. Pp. 43-55 in J. Kammenga and R. Laskowski (editors) *Demography in Ecotoxicology*. Wiley, New York, New York, USA.

2000g. Guardia, R., J. Raventos and **H. Caswell**. Spatial growth and population dynamics of a perennial grass (*Achnatherum calamagrostis*) in a badland area. Journal of Ecology 88:950-963.

1999a**.** Barbeau, M.A. and **H. Caswell**. A matrix model for short-term dynamics of seeded populations of sea scallops. Ecological Applications 9:266-287.

1999b**. Caswell, H.**, M. Fujiwara, and S. Brault. Declining survival probability threatens the North Atlantic right whale. Proceedings of the National Academy of Sciences, USA.96:3308-3313.

1999c. Hill, M. F. and **H. Caswell**. Habitat fragmentation and extinction thresholds on fractal landscapes. Ecology Letters 2:121-127.

1999d. **Caswell, H.** and R. Etter. Cellular automaton models for competition in patchy environments: facilitation, inhibition, and tolerance. Bulletin of Mathematical Biology 61:625-649.

1998a. **Caswell, H.** Entries for *Elasticity analysis, Generation time, Lefkovitch matrix, Leslie matrix, Malthusian parameter, Population projection matrix, Reproductive value, Residual reproductive value, Sensitivity analysis, Situational sensitivity, Size distribution, Stage distribution* in P. Calow (editor) The Encyclopedia of Ecology and Environmental Management. Blackwell Science, Oxford, UK.

1998b. Pineda, J. and **H. Caswell**. Bathymetric species-diversity patterns and boundary constraints on vertical range distributions. Deep-Sea Research II 45:83-101.

1998c. **Caswell, H.** and M. Neubert. Chaos and density-dependent closure terms in planktonic food web models. Journal of Plankton Research 20:1837-1845.

1998d. **Caswell, H.**, S. Brault, A. Read and T. Smith. Harbor porpoise and fisheries: an uncertainty analysis of incidental mortality. Ecological Applications 8:1226-1238.

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

1997b. **Caswell, H.**, A. DeRoos, R. Nisbet, and S. Tuljapurkar. Structured population models: many methods, a few general principles. pp. 3-18 in Tuljapurkar, S. and H. Caswell, (editors). *Structured Population Models in Marine, Terrestrial and Freshwater Systems.* Chapman and Hall, New York.

1997c. **Caswell, H.** Methods of matrix population analysis. pp. 19-58 in Tuljapurkar, S. and H. Caswell, (editors). *Structured Population Models in Marine, Terrestrial and Freshwater Systems.* Chapman and Hall, New York.

1997d. Horvitz, C., D. Schemske, and **H. Caswell**. The " importance" of life history stages to population growth: prospective and retrospective analyses. pp. 247-272 in Tuljapurkar, S. and H. Caswell, (editors). *Structured Population Models in Marine, Terrestrial and Freshwater Systems.* Chapman and Hall, New York.

1997e. Pascual, M. and **H. Caswell**. From the cell cycle to population cycles in phytoplankton-nutrient interactions. Ecology 78:897-912.

1997f. Neubert, M. and **H. Caswell**. Alternatives to resilience for measuring the response of ecological systems to perturbation. Ecology 78:653-665.

1997g. Takada, T. and **H. Caswell**. Optimal size at maturity in size-structured populations. Journal of Theoretical Biology 187:81-93.

1997h. Pascual, M. and **H. Caswell**. Environmental and biological pattern in a chaotic predator-prey system. Journal of Theoretical Biology 185:1-13

1997i. Pineda, J. and **H. Caswell**. Dependence of settlement rate on suitable substrate area. Marine Biology 129:541-548.

1996a **Caswell, H.** Demography meets ecotoxicology: untangling the population level effects of toxic substances. pp. 255-292 in M. C. Newman and C. H. Jagoe (eds.) *Ecotoxicology: A Hierarchical Treatment.* Lewis Publishers, Boca Raton, Florida.

1996b McGraw, J. B. and **H. Caswell**. Estimation of individual fitness from life history data. American Naturalist 147:47-64.

1996c Tayasu, I., N. Shigesada, H. Mukai and **H. Caswell**. 1996. Predator-mediated coexistence of epiphytic grass shrimps that compete for refuges. Ecological Modelling 84:1-10.

1996d **Caswell, H.** Second derivatives of population growth rate: calculation and applications. Ecology 77:870-879.

1996e **Caswell, H.** Analysis of life table response experiments. II. Alternative parameterizations for size- and stage-structured models. Ecological Modelling 88:73-82.

1996f Little, S., S. Ellner, M. Pascual, M. Neubert, D. Kaplan, T. Sauer, **H. Caswell**, and A. Solow. Detecting nonlinear dynamics in spatio-temporal systems, examples from ecological models. Physica D 96:321-333.

1996g Levin, L. A., **H. Caswell**, T. Bridges, C. DiBacco, D. Cabrera, and G. Plaia. Demographic response of estuarine polychaetes to pollutants: Life table response experiments. Ecological Applications 6:1295-1313.

1996h Barradas, I., **H. Caswell** and J. E. Cohen. Competition during colonization vs. competition after colonization in disturbed environments: A metapopulation approach. Bulletin of Mathematical Biology 58:1187-1207.

1995a Pascual, M., A. Ascioti and **H. Caswell**. Intermittency in the plankton: a multifractal analysis of zooplankton biomass variability. Journal of Plankton Research 17:1209-1232.

1995b **Caswell, H.** and J. E. Cohen. Red, white and blue: environmental variance spectra and coexistence in metapopulations. Journal of Theoretical Biology 176:301-316.

1994a **Caswell, H.** and M. C. Trevisan. The sensitivity analysis of periodic matrix models. Ecology 75: 1299-1303.

1994b Etter, R. J. and **H. Caswell**. The advantages of dispersal in a patchy environment: effects of disturbance in a cellular automaton model pp. 93-109. In: K.J. Eckelbarger and C.M. Young (eds.), *Reproduction, Larval Biology and Recruitment in the Deep-Sea Benthos.* Columbia University Press.

1994c Canales, J., M. C. Trevisan, J. F. Silva, and **H. Caswell**. A demographic study of an annual grass *Andropogon brevifolius* (Schwarz) in burnt and unburnt savanna. Acta Oecologica 15: 261-273.

1993a Brault, S. and **H. Caswell**. Pod-specific demography of Killer Whales (*Orcinus orca*). Ecology 74: 1444-1454.

1993b **Caswell, H.** and R. J. Etter. Ecological interactions in patchy environments: from patch-occupancy models to cellular automata. pp. 93-109 In: S. A. Levin, T. Powell and J. H. Steele (eds.) *Patch Dynamics.* Springer-Verlag, New York.

1993c McDonald, D.B. and **H. Caswell**. Matrix methods in avian demography. Current Ornithology 10:139-185.

1993d Maley, C. C. and **H. Caswell**. Implementing individual configuration models for population dynamics: an object-oriented program approach. Ecological Modelling 68:75-89.

1993e **Caswell, H.** and J. E. Cohen. Local and regional regulation of species-area relations: a patch-occupancy model. pp. 99-107. In: R. E. Ricklefs and D. Schluter (eds.). Species *Diversity in Ecological Communities: Historical and Geographic Perspectives.* University of Chicago Press.

1992a **Caswell, H.** and A. M. John. From the individual to the population in demographic models. pp. 36-61. In: D. L. DeAngelis and L. J. Gross (eds.), *Individual Based Models and Approaches in Ecology*. Chapman and Hall, New York.

1992b **Caswell, H.** and S. Brault. Life cycles and population dynamics: mathematical models for marine organisms. Oceanus 35(3): 86-93.

1991a **Caswell, H.** and J. E. Cohen. Disturbance and diversity in metapopulations. Biological Journal of the Linnean Society 42: 193-218.

1991b **Caswell, H.** and J. E. Cohen. Communities in patchy environments: a model of disturbance, competition, and heterogeneity. pp. 97-122. In: J. Kolasa and S. T. A. Pickett (eds.), *Ecological Heterogeneity*. Springer-Verlag, New York.

1991c Pascual, M. and **H. Caswell**. The dynamics of a size-classified benthic population with reproductive subsidy. Theoretical Population Biology 39: 129-147.

1991d Walls, M., **H. Caswell** and M. Ketola. Demographic costs of *Chaoborus*-induced defenses in *Daphnia pulex*: a sensitivity analysis. Oecologia 87: 43-50.

1991e Twombly, S. and **H. Caswell**. Demographic analysis of tropical zooplankton populations. Verh. Int. Ver. Limnol. 24: 1183-1187.

1991f Silva, J. F., J. Raventos, **H. Caswell** and M. C. Trevisan. Population responses to fire in a tropical savanna grass *Andropogon semiberbis*: a matrix model approach. Journal of Ecology 79: 345-356.

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