James R. Watson

Assistant Professor
College of Earth, Ocean and Atmospheric Sciences
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EDUCATION

Ph.D. 2011 **Marine Science**, University of California at Santa Barbara, CA, USA; *Ocean Connectivity and Nearshore Marine Species Populations Dynamics*; Advisor: David Siegel; Committee: Kim Selkoe, Steve Gaines, Bruce Kendall

M.Sc. 2004 **Oceanography**, National Oceanography Centre, Southampton University, UK; *The Tempo of Phytoplankton Evolution;* Advisor: Debora Iglesias Rodriguez; 1st Class Honors

B.Sc. 2001 **Biochemistry and Molecular Genetics**, University of Bristol, UK

SCIENTIFIC EXPERTISE

I am an **interdisciplinary marine scientist** with expertise in biological oceanography, marine and theoretical ecology, network theory, dynamical systems modeling, agent-based modeling, complex adaptive systems theory, resource economics and risk management.

Citations: 1587 **h-index**: 16 **i10-index**: 21 (updated October 2019)

PROFESSIONAL APPOINTMENTS

2017 - present: Assistant Professor, College of Earth, Ocean and Atmospheric Sciences, Oregon State University
2014 - 2017: Research Assistant Professor, Stockholm Resilience Centre, Stockholm University
2013 - 2014: Postdoctoral Research Associate, Department of Ecology and Evolutionary Biology, Princeton University
2011 - 2013: Postdoctoral Research Associate, Atmospheric and Ocean Science Program, Department of Geosciences, Princeton University
2004 - 2006: Research Technician, National Oceanography Centre, Southampton University

HONORS AND AWARDS

2017: DARPA Young Faculty Award
2013: International Research Fellowship, Stockholm University
2007: Luce Environmental Science to Solutions Fellowship, UCSB
2007: Best use of Technology in Fisheries (poster), American Fisheries Society

PEER REVIEWED PUBLICATIONS

* Undergraduates supervised
** Ph.D students supervised or mentored under exchange programs
*** Postdocs supervised or mentored under exchange programs
# co-lead author
[broadest field for categorization]

In review

[43] Titus M*** and **Watson JR**. Critical Speeding Up as an Early Warning Signal of Stochastic Regime Shifts. In review at Theoretical Ecology. [Complex Systems / Ecology]

[42] **Watson JR** and Woodill JA***. Anticipating Illegal Maritime Activities from Anomalous Multiscale Fleet Behavior. In review at Conservation Letters. [Complex Systems / Fisheries]

[41] Siegel DA, **Watson JR**, Simons RD, Mitarai S & McWilliams JC. *Characterizing Particle Transit Time Metrics in a Coastal Ocean Network*. In review at the Journal of Geophysical Research. [Oceanography]

[40] **Watson JR**, Gelbaum Z***, Titus M, Zoch M, Wrathall D. Manifold Learning of the Dominant Modes of Human Mobility. In review at PeerJ Computer Science. [Complex Systems]

[39] Burgess MG, Carrella E, Drexler M, Axtell RL, Bailey RM, **Watson JR**, Ananthanaryanan A, Cabral RB, Clemence M, Costello C, Dorsett C, Gaines SD, Klein ES, Koralus P, Leonard G, Levin SA, Little LR, Lynham J, Madsen JK, Merkl A, Owashi B, Saul SE, van Putten IE, Wilcox S. Opportunities for agent-based modeling in fisheries social science. In review at Fish and Fisheries. [Fisheries]

2019

[38] Petrik CM, Stock CA, Andersen KH, van Denderen PD, **Watson JR**. Bottom-up drivers of global patterns of demersal, forage, and pelagic fishes. Progress in Oceanography. 2019 Jun 17:102124. [Oceanography]

[37] Folke C, Österblom H, Jouffray JB, Lambin EF, Adger WN, Scheffer M, Crona BI, Nyström M, Levin SA, Carpenter SR, Anderies JM, Chapin S, Crépin, A-S, Dauriach A, Galaz V, Gordon L, Kautsky N, Walker BH, **Watson JR**, Wilen J, de Zeeuw A. Transnational corporations and the challenge of biosphere stewardship. Nature ecology & evolution. 2019 Sep 16:1-8. [Economics / Fisheries]

[36] Burgess MG, Carrella E, Drexler M, Axtell RL, Bailey RM, **Watson JR**, Cabral RB, Clemence M, Costello C, Dorsett C, Gaines SD. Opportunities for agent-based modeling in fisheries social science.SocArXiv, DOI: 10.31235/osf.io/gzhm5 [Fisheries]

[35] Titus M***, Gelbaum Z***, **Watson JR**. Critical Speeding up as an early warning signal of regime switching. ArXiv:1901.08084v1 [Complex Systems]

[34] Gelbaum Z***, Titus M***, **Watson JR**. Multi-Scale Analysis on Complex Networks using Hermitian Graph Wavelets. ArXiv:1901.07051v1 [Complex Systems]

[33] McManus LC**, **Watson JR**, Vasconcelos VV, & Levin SA. Stability and recovery of coral-algae systems: the importance of recruitment seasonality and grazing influence. Theoretical Ecology, https://doi.org/10.1007/s12080-018-0388-x. [Ecology]

2018

[32] Elsler L, Drohan S, Schlueter M, **Watson JR**, Levin SA. Local, Global, Multi-level: Market Structure and Multi-species Fishery Dynamics. Ecological Economics, 156, 85-195 [Economics / Fisheries]

[31] **Watson JR**, Amerin F, Klinger D, Belton B. Resilience through Risk Management: Cooperative Weather Insurance in Small-holder Aquaculture Systems. Heliyon 4 (2018) e00799 [Economics]

[30] **Tilman AR, Levin SA & **Watson JR**. Revenue-sharing clubs provide economic insurance as well as incentives for using common-pool resources sustainably. Journal of Theoretical Biology, 454, 205-214. [Economics]

[29] **McManus LC, **Watson JR**, Vasconcelos VV, & Levin SA. *Nonlinear Dynamics of Coral-Algae Systems and Their Recruitment Dependent Resilience*. Theoretical Ecology, https://doi.org/10.1007/s12080-018-0388-x. [Ecology]

[28] **Villarino E., **Watson JR** et al. *Large-scale ocean connectivity and planktonic body size*. Nature Communications 2018, 9 (142) doi:10.1038/s41467-017-02535-8. [Oceanography]

[27] Monk, C.T[#]., Barbier, M[#]., Romanczuk, P[#]., **Watson JR[#],** Alos, J., Nakayama, S., Rubenstein, D.I., Levin, S.A. and Arlinghaus, R. *How ecology shapes exploitation: a framework to predict the behavioural response of human and animal foragers along exploration-exploitation trade-offs*. Ecology Letters, 21, 6, 779-793. [Ecology]

[26] **Watson JR**, Fuller EF, Castruccio F, Samhouri J. *Fishermen Follow Fine-scale Physical Ocean Features for Finance*. Frontiers in Marine Science, 5, 46, doi: 10.3389/fmars.2018.00046. [Ecology]

[25] Thompson D, Kleypas J, Castruccio F, Curchitser E, Pinsky ML, Jonsson B, **Watson JR**. *Variability in physical barriers to coral larval dispersal: do currents shape biodiversity*? Progress in Oceanography, 165, 110-122. [Oceanography]

[24] Tittensor DP, et al. (including **Watson JR**) *A protocol for the intercomparison of marine fishery and ecosystem models: FishMIP v1.0*. Geoscientific Model Development, *11, 1421-1442.* [Oceanography]

[23] Spijkers J, Morrison TH, Blasiak R, Cumming GS, Osborne M, **Watson JR**, Osterblom H. *Marine fisheries and future ocean conflict*. Fish and Fisheries, doi.org/10.1111/faf.12291. [Fisheries]

[22] ***Klinger D, Eikeset AM, Davidsdottir B, Winter A-M & **Watson JR**. *The mechanics of blue growth: Management of oceanic natural resource use with multiple, interacting sectors*. Marine Policy 87 (2018): 356-362. [Economics]

2017

[21] ***Klinger D, Levin SA & **Watson JR**. *The Growth of Finfish Globally in Open Ocean Aquaculture under Climate Change*. Proc. Roy. Soc. B. 284: 20170834. [Economics / Ecology]

[20] **Pena TS, **Watson JR**, Gonzalez-Guzman LI, Keitt TG. *Step-wise drops in modularity and the fragmentation of exploited marine metapopulations*. Landscape Ecology, DOI 10.1007/s10980-017-0532-9. [Ecology]

[19] Hidalgo M, Kaplan DM, Kerr LA, **Watson JR**, Paris CB, Browman HI. *Advancing the link between ocean connectivity, ecological function and management challenges*. ICES Journal of Marine Science. 2017 Jul 1;74(6):1702-7. [Oceanography / Ecology]

[18] **Fuller EF, Samhouri J, Stoll J, Levin SA & **Watson JR**. Characterizing Fisheries Connectivity in Marine Social-Ecological Systems. ICES Journal of Marine Science. DOI:10.1093/icesjms/fsx128. [Fisheries]

[17] ***Klein ES, Barbier M & **Watson JR**. *The Dual Impact of Ecology and Management on the Social Incentives in Marine Systems*. Proceedings of the Royal Society: Open Science. 4: 170740. http://dx.doi.org/10.1098/rsos.170740. [Economics]

2016

[16] Jonnson B[#]. & **Watson JR**[#] *The Timescales of Global Surface-Ocean Connectivity*. Nature Communications, 2016, 7, 1-6. [Oceanography]

[15] **Tilman, AR & **Watson, JR** & Levin, SA. Maintaining cooperation in social-ecological systems: Effective bottom-up management often requires sub-optimal resource use. Theoretical Ecology, 2016, doi:10.1007/s12080-016-0318-8. [Economics / Ecology]

[14] ***Barbier M[#] and **Watson JR**[#]. *The Spatial Dynamics of Predators and the Benefits and Costs of Information Sharing*, PLoS Computational Biology, 2016. *co-lead author. [Ecology]

[13] Kleypas JA, Thompson DM, Castruccio FS, Curchitser EN, Pinsky M, & **Watson JR**, *Larval connectivity across temperature gradients, and its potential effect on heat tolerance in coral populations.* Global Change Biology, DOI: 10.1111/gcb.13347. [Oceanography]

2015

[12] Cheung WWL., et al., and **Watson JR**. *Building confidence in projections of the responses of living marine resources to climate change*. 2015. ICES Journal of Marine Science doi:10.1093/icesjms/fsv250. [Oceanography]

[11] **Watson JR**, Stock C, Sarmiento J. *Exploring the role of movement in determining the global distribution of marine biomass using a coupled hydrodynamic – size-based ecosystem model*. Progress in Oceanography, 2014, 138, 521-532. [Oceanography]

2014

[10] **Watson JR**, *Favetta B, Stock C. *On Modeling the Macroecology of Baleen Whale Migration*, in preprint here: http://biorxiv.org/content/early/2014/09/28/009753. [Ecology]

2013

[9] Osterblöm H, Merrie A, Metian M, Boonstra W, Blenckner T, **Watson JR**, et al. *Modeling social-ecological scenarios in marine systems. BioScience, 2013, 63(9):735-744.* [Fisheries]

2012

[8] **Watson JR**, Kendall BE, Siegel DA, Mitarai S. *Changing seascapes, stochastic connectivity and marine metapopulation dynamics. The American Naturalist, 2012, 180 (1) 990-112. Noted by the Faculty 1000: http://f1000.com/717948573.* [Oceanography / Ecology]

2011

[7] Alberto F, Raimond P, Reed D, **Watson JR**, et al. *Isolation by oceanographic distance accounts for high proportion of genetic differentiation for Macrocystis pyrifera in the Santa Barbara Channel*. Molecular Ecology, 2011, 20(12), 2543-2554. [Seascape Genetics]

[6] **Watson JR**, Siegel D, Kendall B, Mitarai S, Rassweiller A, Gaines S. *Identifying critical regions in small-world marine metapopulations*. PNAS, 2011, 108(43) E907-E913. [Oceanography / Ecology]

[5] **Watson JR**, Hays C, Raimondi P, Siegel D, Mitarai S, Dong C, McWilliams J, Blanchette C. *Currents connecting communities: a study of nearshore marine species in the Southern California Bight*. Ecology, 2011, 92(6), 1193-1200. [Oceanography / Ecology]

2010

[4] **Watson JR**, Mitarai S, Siegel D, Caselle J, Dong C, McWilliams J. *Realized and potential larval connectivity in the Southern California Bight*. Marine Ecology Progress Series, 2010, 401, 31-48. [Oceanography]

[3] White C, Selkoe K, **Watson JR**, Siegel D, Zacherl D, Toonen R. *Ocean currents help explain population genetic structure*. Proc. R. Soc. B, 2010, 277, 1685-1694. [Seascape Genetics]

[2] Selkoe K, **Watson JR**, et al. *Taking the chaos out of genetic patchiness: revealing ecological and oceanographic drivers of seascape genetics in Southern California kelp forests*. Molecular Ecology, 2010, 19, 3708-3726. [Seascape Genetics]

2009

[1] Mitarai S, Siegel D, **Watson JR**, et al. *Quantifying connectivity in the coastal ocean with application to the Southern California Bight*. Journal of Geophysical Research, 2009, 114, C10026, doi:10.1029/2008JC005166. [Oceanography]

RESEARCH GRANTS AND PROPOSALS

Active Grant Funding

2019-2021, Principal Investigator, Securing Sustainable Seas: Near Real-Time Monitoring and Prediction of Global Fishing Fleet Behavior, NASA ROSES A.8 ($855,000).

2017-2019, Principal Investigator, Comparing Micro-Macro Dynamics and Control Across Social-like Systems Using Equation Free Modeling, Defense Advanced Research Projects Agency (DARPA) Young Faculty Award ($500,000).

Completed Funding

2012-2018, Co-Principal Investigator, NSF: Dynamics of Coupled Natural-Human Systems, Social-Ecological Adaptation and Complexity in Marine Systems, Princeton University ($1,500,000).

2016, Principal Investigator, SCOOP - Scaling-up Cooperation through Insurance Web Applications, Stockholm University Innovations Program ($13,000).

2014-2017, Principal Investigator, Social-Environmental Research Network (SEReNe), Stockholm University, Princeton University, University of Oslo, Ca'Foscari University of Venice; Banco Santander ($150,000).

2011-2013, Nippon Foundation Post-doctoral Fellowship, The Nereus Program in Climate and Fisheries Modeling, Princeton University ($180,000).

2008-2011, NASA NESSF PhD Fellowship, Integrating Satellite Observations into Fisheries Science: Quantifying abiotic and in-flight biotic larval from ocean color, University of California, Santa Barbara ($90,000).

TEACHING

At Oregon State University

Courses

GEOG361: Redesigned and taught a core course for geography at OSU on mathematical and computational techniques for spatial analysis*, Winter 201*8.

GEOG361e: Redesigned the e-campus version of the on-campus GEOG361, *Fall 2018*.

At Stockholm University

Courses

Course organizer and principal teacher: Quantitative Methods for Social-Ecological Scientists. Graduate course run at the Stockholm Resilience Centre (Spring 2015, 2017).

Class organizer and principle teacher: Communicating Complexity. Workshop Graduate students on science communication at the Stockholm Resilience Centre (Fall 2014).

STUDENTS ADVISED OR CO-ADVISED

At Oregon State University

Postdoctoral scholars:	Zach Gelbaum (2017- present) Mat Titus (2017- present)
Ph.D students (primary adviser):	Steven Johnson (2017-present) Ciera Villegas (2017-present)
Ph.D student committee:	Anne Devon-Song (Integrative Biology: 2017-present) Sara Hamilton (Integrative Biology: 2017-present)

M.S. students advised: Keiko Nomura (2018-present)

Undergraduate students: Thomas Braun

At Stockholm University
(All as part of a Princeton-Stockholm University exchange)

Postdoctoral scholars mentored: Dane Klinger (Princeton/Stockholm, 2014-2017)
Matthieu Barbier (Princeton/Stockholm, 2014-2017)
Emily Klein (Princeton/Stockholm, 2014-2017)

Ph.D students mentored: Emma Fuller (Princeton/Stockholm, 2014-2017)
Andrew Tilman (Princeton/Stockholm, 2014-2017)
Lisa McManus (Princeton/Stockholm, 2014-2017)

M.S. students advised: Laura Elsler (Stockholm Uni., 2014-16)
Roweena Patel (Stockholm Uni., 2013-15)

Undergraduate advised: Alexander Ahn (Swarthmore College intern, 2015)
Jennifer Zhao (Princeton Uni. intern, 2015)
Angela Zhou (Princeton Uni. intern, 2015)
Bruna Favetta (Princeton Uni. intern, 2014)
Christina Healy (Princeton Uni. intern, 2013)

PROFESSIONAL SERVICE

Workshop / Working Group Member
Fisheries Conflict workshop (with One Earth Future), Denver, Colorado (2017; co-organizer).

Keystone Actors in the Anthropocene (as part of the Royal Swedish Academy of Sciences' Askö meetings), Stockholm, Sweden, 2016.

Spatial Fisheries Analysis workshop (with the Stockholm Resilience Centre), Stockholm, Sweden (2015; organizer).

The Radcliffe Institute for Advanced Study, Harvard University, Life in a Turbulent Environment: participation How the dynamic ocean shapes the distribution, diversity and growth of microorganisms, Harvard, USA (2015).

The National Socio-Environmental Synthesis Center (SESYNC), Managing Recreational Fisheries as Complex Adaptive Socio-Ecological Systems, SESYNC, Maryland, USA (2014).

Mathematical Modeling of Fish Markets (with the Stockholm Resilience Centre), Stockholm, Sweden (2013).

Kellogg Biological Station Summer Educational Program, Enhancing Linkages between Mathematics and Ecology: Adaptive Dynamics, Kalamazoo, Michigan, USA (2012).

The Abdus Salam International Centre for Theoretical Physics, Advanced school on complexity, adaptation and emergence in marine ecosystems, Trieste, Italy (2011)

Chaired Sessions in Conferences
Ocean Sciences annual meeting: Basin to Global-Scale Ocean Transport, Connectivity, and session Dispersal, Portland, OR, USA. Session organizer and chair (2018)

The Integrated Marine Biogeochemistry and Ecosystem Research (IMBER) annual meeting: Approaches to predicting fish from physics: strengths, weaknesses and ways forward, Bergen, Norway. Session organizer and chair (2014).

American Fisheries Society annual meeting, Climate and Fisheries: Responses of a Socio-Ecological System to Global Change, Minneapolis, Minnesota, USA. Session organizer and chair (2012)

Ecological Society of America's annual meeting, Population Dynamics: Modeling, Portland, Oregon USA. Session chair (2012).

Ocean Sciences annual meeting, Spatial Dynamics of Species Abundance and Interactions Across Trophic Levels, Portland, Oregon, USA. Session chair (2011)

Campus and Departmental Service
Co-organizer of Geography Day, CEOAS, 2018.

Proposal Reviewer
The National Science Foundation (NSF), UK's Natural Environment Research Council (NERC), The Natural Sciences and Engineering Research Council of Canada, The EUR-OCEANS Consortium

Journal Editor
ICES Journal of Marine Science (2015-2018)

Journal Referee
ICES Journal of Marine Science, Ecology, Molecular Ecology, Limnology and Oceanography, Conservation Letters, The American Naturalist, Ecology Letters, Journal of Theoretical Biology, Marine Ecology Progress Series, Ecography, PloS ONE, The Royal Society Biology Letters, PNAS, Science.

Professional Memberships
American Geophysical Union, American Society for Limnology and Oceanography, Ecological Society of America, Western Society of Naturalists, American Fisheries Society.

ENTREPRENEURSHIP

Co-Founder and Manager of The Prediction Lab
A data science company focusing on advancing and applying machine and transfer learning methods.

Focal area: harmful algal bloom prediction in Detroit Lake, supported by the City of Salem

INVITED PRESENTATIONS

2019

Watson JR. Advanced spatial data analytics for complex social-ecological systems, ESRI Headquarters, Redlands

Watson JR and Woodill AJ. A new multiscale early-warning system for illegal activities at sea. AGU Fall conference, San Francisco.

2018

Watson JR. The Geography of the World's Oceans Helps to Explain Planktonic Diversity, Ocean Sciences annual meeting, Portland OR.

***Watson JR**, McManus L, Vasconselos V, Levin SA. Spatial marine metacommunity connectivity and the response of the Coral Triangle to climate change. Ecological Society of America annual meeting, New Orleans, LA. *could not attend.

Watson JR. *Managing the complexity and dynamics of marine social-ecological systems*, University of Washington, School of Aquatic and Fisheries Science Quantitative Seminar (invited).

Watson JR. *Complex Adaptive Marine Systems*, Oregon State University, Hatfield Marine Science Center seminar series (invited).

Watson JR. *Understanding the Complexity and Adaptive Nature of Marine Systems*, Oregon State University, Dept. Integrative Biology departmental seminar series (invited).

2017

Watson JR. *Complexity and dynamic marine social-ecological systems*, Scripps Institution of Oceanography Ecology Seminar (invited).

2016

Watson JR. *Cooperation in coupled natural-human systems: its emergence and importance*, The Society for Mathematical Biology annual meeting, part of the "Modelling socio-economic aspects of resource management" symposium (invited).

Watson JR. *Complex Adaptive Marine Systems*, Oregon State University, College of Earth, Ocean and Atmospheric Sciences (invited).

Watson JR. *Understanding the Complexity and Adaptive Nature of Marine Systems*, University of California Santa Barbara, Interdepartmental Marine Sciences Seminar (invited).

2015

Watson JR. *The Effect of Turbulence on the Spatial Dynamics of Fish Populations*, The Radcliffe Institute for Advanced Study, Harvard University, Life in a Turbulent Environment: How the dynamic ocean shapes the distribution, diversity and growth of microorganisms workshop (invited).

Watson JR. *Complex Adaptive Marine Systems*, Danish Technical University Aqua (DTU), Copenhagen, Denmark (invited).

Watson JR. *Understanding the Emergence of Cooperation in Coupled Natural-Human Systems*, The Centennial Ecological Society of America meeting, keynote talk at the Coupled Natural and Human Systems Science: The Need, Challenges and Rewards symposium (invited).

Watson JR. *The Timescales of Global Surface Ocean Connectivity*, The American Society of Limnology and Oceanography annual meeting, Granada, Spain.

2014

Watson JR. *Complex Adaptive Problems in Nature and Society*, The Woodrow Wilson School of Public and International Affairs at Princeton University, The David Bradford Seminars in Science, Technology and Environmental Policy (invited).

Watson JR. *Complexity and Adaptation in Phytoplankton, Fish and Fishers*, Stockholm University, Department of Ecology, Environmental and Plant Sciences (invited).

2013

Watson JR. *Phytoplankton, Fish and Fishing; An analysis of the links between physics, ecology and human behavior in marine systems*, Massachusetts Institute of Technology, Department of Earth, Atmospheric and Planetary Sciences (invited).

Watson JR. *Analyzing the links between physics, ecology and human behavior in marine systems: three examples*, Rutgers University, Institute of Marine and Coastal Science (invited).

Watson JR. *Currents Connecting Communities*, Rutgers University, Haskin Shellfish Research Laboratory (invited).

2012

Watson JR. *Flow, Fish and Fishing; An analysis of the links between physics, ecology and human behavior in marine systems*, McGill University, Earth and Planetary Sciences (invited).

Watson JR. *Earth System Modeling and Global Marine Food-security*, American Fisheries Society, St. Paul, Minnesota.

Watson JR. *Changing Seascapes, Stochastic Connectivity and Marine Metapopulation Dynamics*, Ecological Society of America, Portland, Oregon.

Watson JR. *Quantifying the distribution and dynamics of forage fish using a size-based ecosystem model*, PICES annual meeting, Yeosu, Korea.

Watson JR. *Modeling the Spatial Dynamics of Baleen Whales and Forage Fish*, American Association for the Advancement of Science (AAAS), Vancouver, CA.

2008-2010

Watson JR. *Evidence for dispersal at the community level*, Ocean Sciences Annual Meeting, Portland, Oregon.

Watson JR. *Currents connecting communities*, Western Society of Naturalists, Monterey, California.

Watson JR. *Spatial connections amongst nearshore marine species*, The California Current Ecosystem Long

Watson JR. Marine Metapopulation Dynaics. Term Ecological Research site meeting (LTER), San Diego, California (invited).

Watson JR. *Simulating the impact of El Niño on the gene flow of marine species in the Southern California Bight*, Ocean Sciences Annual Meeting, Orlando, Florida.

Watson JR. *Simulating the dispersal of nearshore marine species larvae*, Department of Atmospheric and Oceanic Sciences, University of California Los Angeles (UCLA), Los Angeles, California (invited).