CURRICULUM VITAE - MOLLIE ELIZABETH BROOKS
Senior Research Scientist
National Institute of Aquatic Resources, Danish Technical University

Email: molbr@aqua.dtu.dk
Mail: DTU Aqua, Kemitorvet, 2800 Lyngby, Denmark
ORCID: https://orcid.org/0000-0001-6963-8326

EDUCATION

Ph.D. Biology, Dissertation: *Four permutations of growth, reproduction, and survival* 2006-2012
   University of Florida, Advisors: Benjamin M. Bolker (Biology) and Mary Christman (Statistics)

B.S. Mathematics with related studies in Computer Science 2001-2004
   University of Pittsburgh, Advisor: William J. Layton

RESEARCH FOCUS

My research focuses on estimating demographic processes and how they vary among and within populations and species in response to environmental and individual heterogeneity. I aim to find general patterns and to develop widely applicable statistical methods.

RESEARCH AREAS

Generalized linear mixed models and their extensions

Statistical models of fisheries gear selectivity

State-space modeling

Template Model Builder and AD Model Builder

Management strategy evaluation

Individual growth and tradeoffs with reproduction

Estimation of biological reference points in stocks with spasmodic reproduction

EMPLOYMENT

Senior Research Scientist: National Institute of Aquatic Resources, Danish Technical U.	2019 -
Research Scientist: National Institute of Aquatic Resources, Danish Technical U.	2017 - 2019
Postdoctoral Researcher: National Institute of Aquatic Resources, Danish Technical U.	2016-2017
Postdoctoral Researcher: Dept. of Evo. Bio. and Environmental Studies, U. of Zurich	2013 - 2016
Postdoctoral Researcher: Dept. of Biology, University of Florida	2012 - 2013
Research Assistant: Dept. of Wildlife Ecology and Conservation, University of Florida	2011
Teaching Assistant: Biological Sciences, University of Florida	2006 - 2008
Research Assistant: Dept. of Biological Sciences, University of Pittsburgh	2006
Teaching Assistant: Dept. of Mathematics, University of Pittsburgh	2004 - 2005

SCIENTIFIC ADVICE, PUBLIC SECTOR CONSULTANCY

Participation in ICES Sandeel Management Strategy Evaluation	2022
Participation in ICES Norway Pout Management Strategy Evaluation	2018 & 2020
Co-chair for ICES Workshop on Data-limited Stocks of Short-lived Species	2019 & 2020
Reviewer for FAO Black Sea Turbot Benchmark	2019
Participation in ICES - FAO Working Group on Fishing Technology and Fish Behaviour	2019 -
Participation in ICES Workshop on Optimization of Biological Sampling	2019 -
Participation in ICES Workshop on Guidelines for Management Strategy Evaluations	2018
Participation in ICES Sprat Management Strategy Evaluation	2018
Participation in ICES Sprat Benchmark	2018

PEER-REVIEWED PUBLICATIONS

F. Lüskow, B. Christiansen, X. Chi, P. Silva, P. Neitzel, M. E. Brooks, C. Jaspers (2022) Distribution and biomass of gelatinous zooplankton in relation to an oxygen minimum zone and a shallow seamount in the Eastern Tropical North Atlantic Ocean. *Marine Environmental Research* 175, 105566

M. E. Brooks, V. Melli, E. Savina, J. Santos, R. Millar, F. G. O'Neill, T. VeigaMalta, L. A. Krag, J. P. Feekings (2022) Introducing selfisher: open source software for statistical analyses of fishing gear selectivity. *Canadian Journal of Fisheries and Aquatic Sciences* 99 (999), 1-9

I. M. F. Kratzer, M. E. Brooks, S. Bilgin, S. Özdemir, L. KindtLarsen, F. Larsen, D. Stepputtis (2021) Using acoustically visible gillnets to reduce bycatch of a small cetacean: first pilot trials in a commercial fishery. *Fisheries Research* 243, 106088

C. McLaverty, G. E. Dinesen, H. Gislason, M. E. Brooks, O. R. Eigaard (2021) Biological traits of benthic macrofauna show size-based differences in response to bottom trawling intensity. *Marine Ecology Progress Series* 671, 1-19

O. Henriksen, A. Rindorf, M. E. Brooks, M. Lindegren, M. van Deurs (2021) Temperature and body size affect recruitment and survival of sandeel across the North Sea. *ICES Journal of Marine Science* 78 (4), 1409-1420

M. van Deurs, M. E. Brooks, M. Lindegren, O. Henriksen, A. Rindorf (2021) Biomass limit reference points are sensitive to estimation method, time?series length and stock development. *Fish and Fisheries* 22 (1), 18-30

C. McLaverty, O. R. Eigaard, H. Gislason, F. Bastardie, M. E. Brooks, P. Jonsson, A. Lehmann, G. E. Dinesen (2020) Using large benthic macrofauna to refine and improve ecological indicators of bottom trawling disturbance. *Ecological Indicators* 110, 105811

M. E. Brooks, K. Kristensen, M. R. Darrigo, P. Rubim, M. Uriarte, E. Bruna, B. M. Bolker. (2019) Statistical modeling of patterns in annual reproductive rates. *Ecology* 100 (7):e02706. 10.1002/ecy.2706

M. E. Brooks, K. Kristensen, K. J. van Benthem, A. Magnusson, C. W. Berg, A. Nielsen, H. J. Skaug, M. Mächler, and B. M. Bolker. (2017) glmmTMB balances speed and flexibility among packages for zeroinflated generalized linear mixed modeling. *The R Journal* 9 (2): 378-400.

M. E. Brooks, C. Clements, J. Pemberton, A. Ozgul (2017) Estimation of individual growth trajectories when repeated measures are missing. *The American Naturalist* 190 (3): 377-388.

M. E. Brooks, M. Mugabo, G. M. Rodgers, T. G. Benton, and A. Ozgul (2015) How well can body size represent effects of the environment on demographic rates? Disentangling correlated explanatory variables. *Journal of Animal Ecology* 85: 318-328.

J. R. Mayor, S. J. Wright, E. Schuur, M. E. Brooks, and B. L. Turner (2014). Stable nitrogen isotope patterns of trees and soils altered by long-term nitrogen and phosphorus addition to a lowland tropical rainforest. *Biogeochemistry* 119: 293-306.

M. Brooks, M. McCoy, B. Bolker (2013) A Method for Detecting Positive Growth Autocorrelation without Marking Individuals. *PLoS ONE* 8: e76389.

B. Bolker, B. Gardner, M. N. Maunder, C. W. Berg, M. Brooks, L. S. Comita, E. E. Crone, S. Cubaynes, T. Davies, P. de Valpine, J. Ford, O. Gimenez, M. Kéry, E. Kim, C. Lennert-Cody, A. Magnusson, S. J. Martell, M. Minami, J. C. Nash, A. Nielsen, J. Regetz, J. A. Royle, H. J. Skaug, and E. Zipkin (2013) Strategies for fitting nonlinear ecological models in R, AD Model Builder, and BUGS. *Methods in Ecology and Evolution* 4: 501-512.

S. Alvarez, M. Mack, M. Brooks (2013) A direct test of nitrogen and phosphorus limitation to net primary productivity in a lowland tropical wet forest. *Ecology* 94: 1540-1551.

M. L. Wayne, G. M. Blohm, M. E. Brooks, K. L. Regan, B. Y. Brown, M. Barfield, R. D. Holt, and B. M. Bolker (2011) The prevalence and persistence of sigma virus, a biparentally transmitted parasite of *Drosophila melanogaster*. *Evolutionary Ecology Research* 13: 323-345.

M. Brooks, and Y. Iwasa (2010) Size-dependent sex change can be the ESS without any size advantage of reproduction when mortality is size-dependent. *Theoretical Population Biology* 78: 183-191.

B. M. Bolker, M. E. Brooks, C. J. Clark, S. W. Geange, J. R. Paulsen, M. H. H. Stevens, and J. S. White (2009) Generalized linear mixed models: a practical guide for ecology and evolution. *Trends in Ecology and Evolution* 24: 127-135.

FELLOWSHIPS, GRANTS AND AWARDS

North Sea in change: fishing in a changing ecosystem, European Maritime and Fisheries Fund (2,500,170 DKK)   *June 2020*

Models and Statistical Tools for Management Strategy Evaluation, European Maritime and Fisheries Fund (1,974,157 DKK)   *Dec 2018*

Developing open source software to fit zero-inflated generalized linear mixed models to ecological data, International Exploratory Workshop Grant, Swiss SNF (9800 CHF)   *Aug 2015*

Fitting Flexible State-Space and Hierarchical Models Using TMB Workshop, Graduate Research Campus Grant, University of Zurich (6190 CHF)   *Aug 2014*

US NSF Integrative Graduate Education and Research Traineeship Fellowship in Quantitative Spatial Ecology, Evolution, & Environment, University of Florida   *2009 - 2011*

US NSF Summer Fellowship in the East Asia and Pacific Summer Institute with the Japanese Society for the Promotion of Science   *2009*

Grinter Fellowship, University of Florida   *2006 - 2010*

Grants funded by the Quantitative Spatial Ecology, Evolution, & Environment training program

- Travel to Thailand to teach Generalized Linear Mixed Models (1400 USD)   *2011*
- Reserve 8 cores, University of Florida High Performance Computing Center (1000 USD)   *2010*
- Travel to Thailand to teach Population Modeling (1400 USD)   *2010*

TEACHING EXPERIENCE

Analyzing Selectivity Data for Fish Capture Technology   *13-14 Aug 2019, 12-13 Aug 2020*
   DTU Aqua, Hirtshals, Denmark

Template Model Builder Workshop   *29 June 2018*
   International Statistical Ecology Conference, St. Andrews, Scotland, *pro bono*

State-Space Modeling using TMB Workshop   *1-3 Sept 2014*
   Dept. of Evolutionary Biology and Environmental Studies, University of Zurich, *pro bono*

AD Model Builder Workshop   *29-30 June 2014*
   International Statistical Ecology Conference, Sete, France, *pro bono*

Generalized Linear Mixed Models in R for Conservation Biologists Workshop   *23-27 May 2011*
   King Mongkut's University of Technology Thonburi, Thailand, *pro bono*

AD Model Builder Workshop, University of Florida   *16-19 May 2011*

Using R and C++ on a High Performance Computing Cluster   *29-30 Nov 2010 & 24 Oct 2012*
   Dept. of Biology, University of Florida, *pro bono*

Population Modeling and Viability Analysis in R Workshop   *19-25 May 2010*
   King Mongkut's University of Technology Thonburi, Thailand, *pro bono*

Seminar Leader: Recent Population Models   *Spring 2010*
   Dept. of Biology, University of Florida, *pro bono*

Teaching Assistant: Biological Sciences, University of Florida   *2006 - 2008*
   Biology 1 Discussion, Biology 1 Lab, Non-majors' Biology Lab

Teaching Assistant: Dept. of Mathematics, University of Pittsburgh   *2004 - 2005*
   Business Calculus Recitations, Calculus 3 Recitations and Maple Computer Labs

PRESENTATIONS

Invited

Trondheim Symp. in statistics, Inst. for Mathematics, Norwegian Univ. of Sci. and Tech. *5 Nov 2021*
  "Template Model Builder applications in ecology"

Coffee club, National Institute of Aquatic Resources, Danish Technical University *11 May 2021*
  "Size- and age-dependent fishing: estimation from experiments and simulating effects on yield"

Seminar on Applied Statistics, ETH Zurich *22 Mar 2019*
  "Flexible generalized linear models with glmmTMB"

Dept. of Evolutionary Biology and Environmental Studies, University of Zurich *25 Nov 2014*
  "How well does body size represent the effects of past and current environments on demography?"

Quantitative Spatial Ecology, Evolution, and Environment Symp., University of Florida *24 April 2014*
  "Evolutionary Demography in a Model Lab System"

Statistical Society of Canada annual meeting, Edmonton, Alberta, Canada *27 May 2013*
  "Predicting Temporally Autocorrelated Pond Depths with Irregular Time Series Data Using ADMB"

Dept. of Integrative Biology, University of South Florida, Tampa, Florida *20 Sept 2012*
  "Revisiting the effects of forest fragmentation on plant demography in the Amazon"

Mathematical Biology Laboratory, Dept. of Biology, Kyushu University, Fukuoka, Japan *7 June 2011*
  "Size-dependent sex change can be the ESS when mortality is size-dependent, without any size advantage of reproduction"

Contributed

International Statistical Ecology Conference, online *June 2020*
  "Bootstrapping binomial GLMMs in fisheries"

International Statistical Ecology Conference, St. Andrews, Scotland *July 2018*
  "GLMMs of reproduction with generalized Poisson and Conway-Maxwell-Poisson distributions fit with glmmTMB"

International Statistical Ecology Conference, Seattle, USA *June 2016*
  "A state-space autoregressive model to quantify patterns of growth"

Ecological Society of America annual meeting, Baltimore, Maryland *14 Aug 2015*
  "How well does body size represent the effects of past and current environments on demography?"

British Ecological Society Symp.: Demography Beyond the Population, Sheffield, UK *24 March 2015*
  "Decomposed variance and covariance of demographic rates using mixed models"

International Statistical Ecology Conference, Montpellier, France *1 July 2014*
  "Comparing vital rate estimates from unmarked population- and individual-level data"

Ecological Society of America annual meeting, Portland, Oregon *Aug 2012*
  "Variability in demographic rates on multiple scales: *Heliconia acuminata* in fragments of the Amazon"

Ecological Society of America annual meeting, Austin, Texas *Aug 2011*
  "A method for detecting among-individual differences in growth rate without marking individuals"

Ecological Society of America annual meeting, Pittsburgh, Pennsylvania *Aug 2010*
  "Size-dependent sex change can be the ESS when mortality is size-dependent, without any size advantage of reproduction"

International Statistical Ecology Conference, Canterbury, England *June 2010*
  "A method for detecting growth that is autocorrelated within individuals through time"

SOFTWARE DEVELOPMENT

Maintainer

glmmTMB: An R package for fitting generalized linear mixed models (GLMMs) and extensions

selfisher: An R package for modeling the selectivity of fisheries gear

growmod: An R package for fitting state-space models to individual growth trajectories

Contributor

TMB: An R package for fast and flexible maximum-likelihood estimation

SAM: An R package for fitting state-space stock assessment models

PROFESSIONAL SERVICE

PhD defence opponent - Inst. for Mathematics, Norwegian Univ. of Sci. and Tech.	*Feb 2022*
Japan Society for Promotion of Science Alumni Club Denmark Vice-chair	*2020-*
Japan Society for Promotion of Science Alumni Club Denmark Board Member	*2019 -2020*
ADMB Foundation Secretary	*2016 -2020*
ADMB Foundation Member	*2011 -*
Postdoctoral researcher representative, University of Zurich	*2015 - 2016*
Middle School Science Fair Judge	*2005 - 2013*

MS reviewer for *ICES Journal of Marine Science, Canadian Journal of Fisheries and Aquatic Sciences, Ecology, Animal Behaviour, Journal of Theoretical Biology, Evolution, Journal of Animal Ecology, Methods in Ecology and Evolution, Peer J, Limnology and Oceanography, Royal Society Open Science, British Journal of Mathematical and Statistical Psychology, Advances in Statistical Analysis*

Frequent contributor of advice on *R-sig-mixed-models@r-project.org* mailing list