MEI SATO

Biology Department, Woods Hole Oceanographic Institution
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RESEARCH INTERESTS

My research focuses on biological-physical interactions, addressing how environment influences animal behavior and distributions in coastal ecosystems and how those interactions affect trophic dynamics including zooplankton, fish, and marine mammals. In order to address problems across a range of temporal/spatial scales, I use active acoustics in different platforms (vessels, moorings, cabled observatories, AUVs) combined with net sampling and physical measurements.

CURRENT POSITION

Assistant Scientist, Woods Hole Oceanographic Institution 06/21 – present

EDUCATION

Ph.D., Oceanography 2013
University of Victoria, BC, Canada
Research advisors: *Drs. John F. Dower and Eric Kunze*

M.S., Oceanography 2006
University of Maine, Darling Marine Center, ME, USA
Research advisor: *Dr. Peter A. Jumars*

B.S., Aquatic Biosciences 2004
Tokyo University of Fisheries, Japan
Senior thesis advisor: *Dr. Hidekatsu Yamazaki*
(One-year exchange program at University of Victoria: 2001 – 2002)

PREVIOUS EXPERIENCE

Guest Investigator, Woods Hole Oceanographic Institution 10/19 – 06/21

Research Associate, University of British Columbia 01/18 – 06/20
Collaborator: *Drs. Andrew Trites, Stéphane Gauthier*

Postdoctoral Research Associate, Oregon State University 06/15 – 12/17
Research advisors: *Drs. Kelly Benoit-Bird and Jack Barth*

Postdoctoral Research Associate, University of Washington 05/13 – 06/15
Research advisor: *Dr. John Horne*
Collaborators: *Drs. Julie Keister, Sandra Parker-Stetter, Tim Essington*

Research Assistant, University of Victoria 05/09 – 05/13
Collaborators: *Drs. Jody Klymak, David Mackas, Richard Dewey*

Acoustic Data Analyst/ Project Coordinator, Kaijo Sonic Corporation Co., Ltd. 04/07 – 03/09
(commercial underwater acoustics company, Japan)

Research Assistant, University of Maine 05/04 – 12/06

CONTINUING PROFESSIONAL EDUCATION

Ocean Observatory Initiative (OOI) Pioneer Array Relocation Innovations Lab, National Science Foundation/OOI Facility Board 03, 06/21

Media Workshop hosted by Informed Opinions, University of British Columbia 11/19

Science Communication Workshop, PICES Annual Meeting 10/19

Early-career Acousticians Retreat, Acoustical Society of America 05/16
Focused on leadership development

UNOLS Ocean Observatory Initiative (OOI) Coastal Arrays Community Workshop, National Science Foundation 01, 09/16

UNOLS Chief Scientist Training Cruise, *R/V* Sharp, University of Delaware 11/15
Focused on robotic platforms

Research Exchange at University of Concepción, Chile 03/15

PEER-REVIEWED PUBLICATIONS

Sato, M. A. W. Trites, S. Gauthier. Southern resident killer whales encounter higher prey densities than northern resident killer whales during summer. Canadian Journal of Fisheries and Aquatic Sciences. *In press*.

Moriarty, P. E., T. E. Essington, J. K. Horne, J. E. Keister, L. Li, S. L. Parker-Stetter, and **M. Sato**. 2020. Unexpected food web responses to low dissolved oxygen in an estuarine fjord. *Ecological Applications* e02204.

Benoit-Bird, K. J, T. P. Welch, C. M. Waluk, J. A. Barth, I. Wangen, P. McGill, C. Okuda, G. A. Hollinger, **M. Sato**, S. McCammon. 2018. Equipping an underwater glider with a new echosounder to explore ocean ecosystems. *Limnology and Oceanography: Methods* 16:734-749.

Sato, M., J. A. Barth, K. J. Benoit-Bird, S. D. Pierce, T. J. Cowles, R. D. Brodeur, and W. T. Peterson. 2018. Coastal upwelling fronts as a boundary for planktivorous fish distributions. *Marine Ecology Progress Series* 995: 171-186.

Sato, M. and K. J. Benoit-Bird. 2017. Spatial variability of deep scattering layers shapes the Bahamian mesopelagic ecosystem. *Marine Ecology Progress Series* 580: 69-82.

Sato, M., J. K. Horne, S. L. Parker-Stetter, T. E. Essington, J. E. Keister, P. E. Moriarty, L. Li, and J. Newton. 2016. Impacts of moderate hypoxia on fish and zooplankton prey distributions in a coastal fjord. *Marine Ecology Progress Series* 560: 57-72.

Sato, M., J. K. Horne, S. L. Parker-Stetter, and J. E. Keister. 2015. Acoustic classification of coexisting taxa in a coastal ecosystem. *Fisheries Research* 172: 130-136.

Sato, M., J. M. Klymak, E. Kunze, R. Dewey, and J. F. Dower. 2014. Turbulence and internal waves in Patricia Bay, Saanich Inlet, British Columbia. *Continental Shelf Research* 85: 153-167.

Sato, M., J. Dower, E. Kunze, and R. Dewey. 2013. Second-order seasonal variability in diel vertical migration timing of euphausiids in a coastal inlet. *Marine Ecology Progress Series* 480: 39-56.

Borstad, G., L. Brown, **M. Sato**, D. Lemon, R. Kerr, and P. Willis. 2010. Long zooplankton time

series with high temporal and spatial resolution. Oceans 2010 MTS/IEEE Seattle, 9 pp. DOI: 10.1109/OCEANS.2010.5664585.

Sato, M. and P.A. Jumars. 2008. Seasonal and vertical variations in emergence behaviors of *Neomysis americana*. *Limnology and Oceanography* 53: 1665-1677.

Sato, M. and H. Yamazaki. 2008. Estimating micro-scale intermittency of fluorescence fields from conventional CTD measurements. *Journal of Marine Systems* 70: 240-247.

Sato, M. and G.C. Jensen. 2005. Shell selection by hermit crab, *Pagurus hartae* (Mclaughlin & Jensen, 1996) (Decapoda, Anomura). *Crustaceana* 78: 755-760.

OTHER PUBLICATIONS

Sato, M., K.J Benoit-Bird, K. Fletcher, W. Waldorf, C. and Wingard. 2016. Split-beam calibration of the OOI echosounder. Report for the Ocean Observatories Initiative.

Sato, M., J. Dower, E. Kunze, and R. Dewey. 2016. Second-order seasonal variability in diel vertical migration timing of euphausiids in a coastal inlet (supplemental data). University of Victoria Libraries [doi: 10.18357/SatoM.2016.data01].

Sato, M. 2013. Variability in diel vertical migration of zooplankton and physical properties in Saanich Inlet, British Columbia. Ph.D. Dissertation. School of Earth and Ocean Sciences, University of Victoria.

Sato, M. 2006. Diel and tidal rhythms of emergence events based on acoustic observations in a shallow estuary. Master's Thesis. School of Marine Sciences, University of Maine.

Sato, M. 2004. Estimating micro-scale intermittency of fluorescence fields from conventional CTD measurements. Undergraduate Senior Thesis, Tokyo University of Fisheries.

INVITED SEMINARS

University of British Columbia, Environmental Fluid Mechanics Group	May, 2019
Woods Hole Oceanographic Institution, Woods Hole, MA	April, 2019
Skidaway Institute of Oceanography, Savannah, GA	February, 2019
Tohoku National Fisheries Research Institute, Shiogama, Japan	June, 2017
Korea Polar Research Institute, Inchon, South Korea	June, 2017

SEMINARS

University of British Columbia, Physical Oceanography Group	February, 2019
Tokyo University of Marine Science and Technology, Tokyo, Japan	June, 2017
National Research Institute of Fisheries Engineering, Choshi, Japan	June, 2017
Hatfield Marine Science Center, Newport, OR	May, 2017
Oregon State University, Glider Group	April, 2017
Oregon State University, College of Earth, Ocean, and Atmospheric Sciences	April, 2016
University of Antofagasta, Antofagasta, Chile	March, 2015
University of Washington, School of Oceanography	January, 2014
Institute of Ocean Sciences, Department of Fisheries and Oceans Canada	November, 2009

INVITED PRESENTATIONS

Sato, M. 2016. More than up and down: Insights into zooplankton phenology through long-term acoustic monitoring. *Saanich Inlet Symposium, Ocean Networks Canada*, February 2016,

Victoria, BC, Canada.

Sato, M. and P.A. Jumars. 2010. Seasonal and vertical variations in emergence behaviors based on acoustic observations in a shallow estuary. *44th Canadian Meteorological and Oceanographic Society Congress*, June 2010, Ottawa, ON, Canada.

CONFERENCE PRESENTATIONS

[Out of total – First author: 18 oral presentations/ 5 posters, Co-author: 11]

Fortune, S., **M. Sato**, and A. Trites. 2019. Are there enough Chinook salmon for Southern Resident Killer Whales? *World Marine Mammal Conference*, December 2019, Barcelona, Spain. (poster)

Sato, M. and A.W. Trites. 2019. "Seeing" prey provides insights into the decline of southern resident killer whales. *27th Annual B.C. Marine Mammal Symposium*, November 2019, Vancouver, B.C. (oral)

Sato, M., A.W. Trites, and S. Gauthier. 2019. "Seeing" prey provides insights into the decline of southern resident killer whales. *PICES Annual Meeting*, October 2019, Victoria, BC, Canada. (oral)

Guan, L., **M. Sato**, A. Sastri, C. Hsieh, and R. Dewey. 2019. Long-term bio-acoustic monitoring of zooplankton dynamics in Saanich Inlet, British Columbia, Canada. *PICES Annual Meeting*, October 2019, Victoria, BC, Canada. (oral)

Sato, M. 2018. "Seeing" what killer whales visualize. *26th Annual B.C. Marine Mammal Symposium*, November 2018, Vancouver, B.C. (oral)

Sato, M., A.W. Trites. 2018. Assessing the availability and accessibility of prey for the Southern Resident Killer Whales. *PICES Annual Meeting*, October 2018, Yokohama, Japan. (poster)

Sato, M., D.L. Mackas, J.F. Dower. 2018. Impacts of hypoxia on diel vertical migration of zooplankton. *PICES Annual Meeting*, October 2018, Yokohama, Japan. (oral)

Sato, M., J.A. Barth, K.J. Benoit-Bird, S.D. Pierce, T.J. Cowles, R.D. Brodeur, W.T. Peterson. 2018. Coastal upwelling fronts as a boundary for planktivorous fish distributions. *Ocean Sciences Meeting*, February 2018, Portland, OR. (oral)

Benoit-Bird, K.J., J.P. Ryan, J.A. Barth, C.M. Waluk, P. Welch, **M. Sato**, S.D. Pierce, A. Erefeev. 2018. Behavioral responses of forage species to intra-seasonal variation in upwelling. *Ocean Sciences Meeting*, February 2018, Portland, OR. (oral)

Sato, M., K.J. Benoit-Bird, J.A. Barth, S.D. Pierce. 2017. Seasonal shift in hot spots associated with an upwelling front in the California Current System: GLOBEC revisited. *PICES/ICES 3rd Early Career Scientist Conference*, June 2017, Busan, South Korea. (oral)

Sato, M., K.J. Benoit-Bird. 2016. Heterogeneity of deep scattering layer shapes the Bahamian mesopelagic ecosystem. *5th Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan*, November 2016, Honolulu, HI. (oral)

Sato, M., K.J. Benoit-Bird, J.A. Barth, S.D. Pierce. 2016. Characteristics of biological "hot spots" associated with an upwelling front: GLOBEC revisited. *Eastern Pacific Ocean Conference*, September 2016, Mt. Hood, OR. (oral)

Sastri, A., R. Dewey, S. Mihaly, M. Sato, J. Dower , R. Pawlowicz. 2016. Evaluation of fixed-point echosounder multi-year time-series: an example from cabled, single and multifrequency echosounders in coastal British Columbia, Canada. *ICES/PICES 6th Zooplankton Production Symposium*, May 2016, Bergen, Norway. (poster)

Riquelme-Bugueño, R., P. Hidalgo, I. Pérez-Santos, **M. Sato**, J. Keister, P. Ruz. 2016. Integrating zooplankton measurements from ADCP acoustic backscatter and net sampling in an upwelling

area of the northern Humboldt Current System. *ICES/PICES 6th Zooplankton Production Symposium*, May 2016, Bergen, Norway. (poster)

Sato, M., J. K. Horne, S. L. Parker-Stetter, T. E. Essington, J. E. Keister, P. E. Moriarty, L. Li, and J. Newton. 2016. Hypoxia impacts on food web linkages in a pelagic ecosystem. *Ocean Sciences Meeting*, February 2016, New Orleans, LA. (poster)

Keister, J.E., T. Essington, B. Herrmann, J. Horne, L. Li, P. Moriarty, S. Parker-Stetter, **M. Sato**, A. Winans. 2016. Zooplankton distribution and species composition along an oxygen gradient in Puget Sound, WA. *Ocean Sciences Meeting*, February 2016, New Orleans, LA. (oral)

Li, L., J.E. Keister, **M. Sato**. 2015. Fighting a hard battle: Effects of hypoxia and temperature on euphausiids in the North Pacific. *PICES*, October 2015, Qingdao, China. (oral)

Sato, M., T.E. Essington, J. Horne, J. Keister, P.E. Moriarty. 2015. How does hypoxia govern energy flows in pelagic food webs? *American Fisheries Society*, August 2015, Portland, OR. (oral)

Krogh, J., A. Sastri, R. Dewey, **M. Sato**. 2015. Zooplankton biomass estimates from acoustic backscatter in the Salish Sea, British Columbia, Canada. *49th Canadian Meteorological and Oceanographic Society Congress*, June 2015, Whistler, BC, Canada. (oral)

Sato, M., J.K. Horne, S.L. Parker-Stetter. 2015. Resilience to hypoxia: temporal and spatial dynamics of pelagic communities in a seasonally hypoxic fjord. *7th International Council for the Exploration of the Sea (ICES) Symposium*, May 2015, Nantes, France. (poster)

Keister, J.E., T.E. Essington, **M. Sato**, J.K. Horne, S.L. Parker-Stetter, and A.K. Winans. 2015. Consequences of hypoxia on distributions, species composition, predator-prey interactions, and energy flow in a pelagic marine ecosystem. *PICES 3rd International Symposium*, March 2015, Santos City, Brazil. (poster)

Sato, M., J. Horne, and S. Parker-Stetter. 2014. Fish and zooplankton distributions in a seasonally hypoxic fjord. *Salish Sea Conference*, April 2014, Seattle, WA. (oral)

Sato, M., D. Mackas, J. Dower, and R. Dewey. 2014. Inter- and intra-annual variability of zooplankton abundance in Saanich Inlet, British Columbia. *Ocean Sciences Meeting*, February 2014, Honolulu, HI. (poster)

Moriarty, P., T. Essington, J. Horne, J. Keister, S. Parker-Stetter, and **M. Sato**. 2013. The effect of hypoxia on energy flow in pelagic food webs. *Western Society of Naturalists*, November 2013, Oxnard, CA. (poster)

Sato, M., J. Dower, E. Kunze, and R. Dewey. 2012. Second-order variability in diel vertical migration timing of euphausiids in Saanich Inlet. *Saanich Inlet Symposium*, May 2012, Victoria, BC, Canada (oral).

Sato, M., J. Dower, E. Kunze, and R. Dewey. 2012. Inter- and intra-annual variability of diel vertical migration in a coastal inlet. *Ocean Sciences Meeting*, February 2012, Salt Lake City, UT. (poster)

Sato, M., J. Dower, E. Kunze, and R. Dewey. 2011. Characteristics of diel vertical migration: bio-acoustic time-series from the VENUS network. *45th Canadian Meteorological and Oceanographic Society Congress*, June 2011, Victoria, BC, Canada. (oral)

Borstad, G., L. Brown, **M. Sato**, D. Lemon, R. Kerr, and P. Willis. 2011. Analysis of zooplankton time series from an upward looking sonar: The data-cube concept. *5th International Zooplankton Production Symposium (ICES & PICES)*, March 2011, Pucón, Chile. (poster)

Sato, M., J. Dower, E. Kunze and R. Dewey. 2010. Characteristics of diel vertical migration based on one-year acoustic records in Saanich Inlet. *44th Canadian Meteorological and Oceanographic Society Congress*, June 2010, Ottawa, ON, Canada. (oral)

Sato, M., J. Dower, E. Kunze and R. Dewey. 2010. One-year record of variability in diel vertical migration from the VENUS observatory in Saanich Inlet. *Washington-British Columbia Chapter of the American Fisheries Society* and 2010 Pink and Chum Salmon Workshop, March 2010, Nanaimo, BC, Canada. (oral)

Sato, M. and P.A. Jumars. 2007. Periods and phases of emergence rhythms dependent on season and depth. *Oceanographic Society of Japan Meeting*, March 2007, Tokyo, Japan. (oral)

Sato, M. and P.A. Jumars. 2006. Diel and tidal rhythms of mysid emergence in a shallow estuary. *4th Joint Meeting of the Acoustical Society of America and Acoustical Society of Japan*, November 2006, Honolulu, HI. (oral)

Sato, M. and H. Yamazaki. 2004. Estimating micro-scale intermittency of fluorescence fields from conventional CTD measurements. *Oceanographic Society of Japan Meeting*, March 2004, Tsukuba, Japan. (oral)

TEACHING EXPERIENCE

Guest Lecturer, University of British Columbia 01/19
EOSC 473 Methods in Oceanography

Guest Lecturer, Oregon State University 04/17
OC 521 Applications in Ocean Ecology and Biogeochemistry

Guest Lecturer, Oregon State University 05/16
OC 440 Introduction to Biological Oceanography

Assisted with Senior Thesis Research, University of Washington 02/15
School of Oceanography

Guest Lecturer, University of Washington 10/14
OCEAN 430 Biological Oceanography

Guest Lecturer, University of Washington 10/13
FSH 538 Fisheries Acoustics

Teaching Assistant, University of Victoria 01-04/12
EOS 110 Oceans and Atmosphere

SYNERGISTIC ACTIVITIES

Professional service

Reviewer for *Limnology and Oceanography*, *Marine Ecology Progress Series*, *Journal of Plankton Research*, *Deep-Sea Research II*, *ICES Journal of Marine Sciences*, *Progress in Oceanography, Fisheries Research, Aquatic Living Resources, Invertebrate Reproduction and Development, NOAA Northwest Fisheries Science Center Internal Grant, NSF Ocean Technology and Interdisciplinary Coordination Program*

Subject Matter Expert for the Ocean Observatories Initiatives 08/2016 - present

Workshop co-organizer (*Synthesis of bio-acoustics programs for monitoring zooplankton and fisheries in the North Pacific*) at PICES 2019 Annual Meeting 10/2019

Mentoring of students

Kiah Lee (B.S. Student, University of British Columbia) 05/19-08/19
Taryn Scarff (B.S. Student, University of British Columbia) 01/19-04/19, 08/19-09/19
BethElLee Herrmann (B.S. Student, University of Washington) 05/14-08/14
Shannon Hennessey (B.S. Student, University of Washington) 05/13-08/13
Randy Jones (B.S. Student, Connecticut College) 05/06-08/06

Outreach

Science Fair Judge for the Vancouver Island region, Victoria, BC (2012). Organized hands-on experiments for 4th - 6th grades including plankton identification and microscopy, bio-physical interactions in the ocean, and dissection of squid at the Hakodate Community Outreach Program for Education in Japan (2007 – 2008). Teaching visiting school groups at the Darling Marine Center, University of Maine, about marine science (2005 – 2006).

Co-organizer of mini-workshops with stake holders (sport fishing guides/whale watching boat owners) in Vancouver, Victoria, Sooke, Port Renfrew, and Port McNeil, BC (2018).

Department service

Co-organizer for the seminar series at the School of Aquatic and Fishery Sciences, University of Washington, which provided a venue for graduate students, postdocs, and research staff to present their research within the department (2014 – 2015). Judge for student presentations at the Graduate Student Symposium at University of Washington (2014).

SEA-GOING EXPERIENCES

Vessel	Project	Location
2020 *MSV Gikumi*	Killer Whale Prey Fields	Johnstone Strait/Juan de Fuca Strait (31 days)
2019 *MSV Gikumi*	Killer Whale Prey Fields	Johnstone Strait/Juan de Fuca Strait (22 days)
2019 *F/V Carte Blanche**	Acoustic-trawl surveys	Johnstone Strait/Juan de Fuca Strait (22 days)
2018 *F/V Nordic Pearl**	Acoustic-trawl surveys	Johnstone Strait/Juan de Fuca Strait (16 days)
2018 *R/V Kraken**	Acoustic surveys	Juan de Fuca Strait (5 daytrips)
2018 *R/V Kraken**	Acoustic surveys	off Gabriola Island (5 daytrips)
2018 *R/V Kraken**	Acoustic calibration	Indian Arm, BC (1 daytrip)
2017 *R/V Sikuliaq*	Zooplankton Sampling	Oregon coast (7 days)
2017 *R/V Oceanus*	Inner Shelf Moorings/CTDs	Newport to San Francisco (16 days)
2017 *R/V Sikuliaq*	Zooplankton Sampling	Oregon coast (7 days)
2016 *R/V Elakha*	Glider deployment/recovery	Oregon coast (2 daytrips)
2015 *R/V Sharp*	UNOLS Chief Scientist Training	Mid-Atlantic Bight (7 days)
2015 *R/V Sharp*	Beaked Whale Prey Fields	Bahamas (13 days)
2013 *R/V Centennial*	Hypoxia Effects on Food Web	Hood Canal, WA (6 days/month in Jun-Oct)
2011 *R/V Thompson*	VENUS Maintenance	Saanich Inlet/Strait of Georgia, BC (5days)
2011 *CCGS Tully*	LaPerouse Zooplankton Monitoring	Vancouver Island Coasts, BC (10 days)
2011 *MSV Strickland**	Zooplankton Sampling	Saanich Inlet, BC (daytrips every few months)
2010 *MSV Strickland*	Mooring Deployment/Recovery	Saanich Inlet, BC (4 days)
2010 *CCGS Vector*	Zooplankton/Fish Larvae Sampling	Strait of Georgia, BC (4 days)
2010 *MSV Strickland**	Zooplankton Sampling	Saanich Inlet, BC (daytrips every few months)
2010 *CCGS Tully*	VENUS Maintenance	Saanich Inlet/Strait of Georgia, BC (5days)
2009 *CCGS Tully*	VENUS Maintenance	Saanich Inlet/Strait of Georgia, BC (6days)
2005 *R/V Cape Hatteras*	Thin Layer Dynamics	Gulf of Maine, ME (10 days)
2003 *R/V Seiyo Maru*	Microstructure Turbulence Study	Oshima Island, Tokyo (4 days)

***** Chief scientist

TECHNICAL SKILLS

Net sampling techniques

- Bongo net
- Isaacs-Kidd midwater trawl
- Marinovich midwater trawl
- MOCNESS
- Sediment trap

Tucker trawl

Remote sensing techniques
ASL Environmental Sciences: Acoustic Water Column Profiler
BAE SYSTEMS: Tracor Acoustic Profiling Systems (TAPS)
Hydroacoustic Technology, Inc (HTI): Model 244 Multifrequency echosounder
Simrad: EK60s, EK80s
Nortek AS: Vector velocimeter
WETLabs: ECO-BB2F, C-Star Transmissometer
RD Instruments: ADCP

Scientific programming: Matlab, Echoview

Language: Fluent in Japanese and English (written & spoken)

MEDIA & WEBSITE COVERAGE

Researchers Revealed: "*In search of salmon*" 10/18
Southern resident killer whale and Chinook salmon project covered by the Beaty Biodiversity Museum in the University of British Columbia
(https://beatymuseum.ubc.ca/whats-on/exhibitions/online-exhibitions/researchers-revealed/in-search-of-salmon/)

Ocean Observatories Initiative Early Career Highlight: "*Using sound to unravel how animals change their behavior in complex environments*" 09/18
(https://oceanobservatories.org/2018/09/early-career-highlight-mei-sato/)