

DAVID E. CADE – CURRICULUM VITAE

Hopkins Marine Station, Stanford University
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EDUCATION

Ph.D. Biology, **Stanford University** (2019)
M.Sc. Earth, Ocean and Atmospheric Sciences, **Oregon State University** (2014)
M.A. Education, **Stanford University** (2005)
B.A. Mathematics, **Brown University** (2002) C.V. Starr fellow for public service

RESEARCH & ACADEMIC HISTORY

Stanford University, Post-doc, Hopkins Marine Station. 2021-present
Energetics of filtration feeding across taxa
(PI: Jeremy Goldbogen)

University of California, Santa Cruz, Post-Doc, Institute of Marine Science, 2019-2021. What axes of heterogeneity enable niche separation of the same prey resource by Antarctic predators?
(PI: Ari Friedlaender)

Stanford University, Hopkins Marine Station. Ph.D. program, Dept. of Biology, 2014-2019
Multi-scale drivers of efficiency in rorqual whale engulfment filtration feeding.
(Advisor: Jeremy Goldbogen)

Oregon State University, M.Sc. program, College of Earth, Ocean, and Atmospheric Sciences, 2011-2014. Detection, classification and ecology of acoustic scattering layers.
(Advisor: Kelly Benoit-Bird)

Stanford University, M.A. program. California Teaching Credential in Mathematics, 2004-2005
Using metaphors to explore the properties of exponents with 9th graders.
(Supervisor: Beth Injasoulian)

TEACHING EXPERIENCE *(listed by relevancy)*

University of San Francisco, San Francisco, CA. Adjunct Professor, Marine Biology, 2014

Summit Preparatory Charter High School, Redwood City, CA. Mathematics Teacher, All levels, 2006-2010

Cross-Cultural Environmental Leadership School (XCEL), San Francisco, CA. Mathematics Teacher, Algebra and Geometry, 2005-2006

Mission High School, San Francisco, CA. Student teacher, Freshmen integrated math, 2004-2005

Stanford University, Palo Alto, CA. TA for Biologging, 2016, Plant Biology, 2015

Oregon State University, Corvallis, OR. Teaching Assistant, Introductory Biology, 2014

Various, Experiential and environmental education instructor in New Hampshire, New Mexico, Washington and Utah wilderness areas, 1999-2004

PUBLICATIONS ([google scholar profile](#)) ([pdf links](#))

- Cade, D.E.**, Fahlbusch, J.A., Oestreich, W., Ryan, J., Calmbokidis, J., Findlay, K.P., Friedlaender, A.S., Hazen, E., Seakamela, S.M. & Goldbogen, J.A. (in press) Social exploitation of extensive, ephemeral, environmentally controlled prey patches by super-groups of rorqual whales. *Animal Behaviour*
- Cade, D.E.**, Gough, W.T., Czapanskiy, M.F., Fahlbusch, J.A., Kahane-Rapport, S.R., Linsky, J.L., Nichols, R.C., Oestreich, W.K., Wisniewska, D.M., Friedlaender, A.S. & Goldbogen, J.A. (2021) Tools for integrating accelerometry data with video bio-loggers, including estimation of animal orientation, motion, and position. *Animal Biotelemetry*. 9:34.
- Cade, D.E.**, Seakamela, S. M., Findlay, K. P., Fukunaga, J., Kahane-Rapport, S.R., Warren, J., Calmbokidis, J., Fahlbusch, J., Friedlaender, A. S., Hazen, E., Kotze, D., McCue, S., Meyer, M., Oestreich, W., Oudejans, M., Wilke, C. & Goldbogen, J. A. (2021) Predator-scale spatial analysis of intra-patch prey distribution reveals the energetic drivers of rorqual whale super-group formation. *Functional Ecology*, 35 (4): 894-908
- Czapanskiy, M.F., Savoca, M.S., Gough, W.T., Segre, P.S., Wisniewska, D.M., **Cade, D.E.** & Goldbogen, J.A. (2021) Modeling short-term energetic costs of sonar disturbance to cetaceans using high resolution foraging data. *Journal of Applied Ecology*.
- Gough, W.T., Smith, H.J., Savoca, M.S., Czapanskiy, M.F., Fish, F.E., Potvin, J., Bierlich, K.C., **Cade, D.E.**, Di Clemente, J., Kennedy, J., Segre, P.S., Stanworth, A., Weir, C. & Goldbogen, J.A. (2021) Scaling of oscillatory kinematics and propulsive efficiency in baleen whales. *Journal of Experimental Biology*.
- Potvin, J., **Cade, D.E.**, Werth, A.J., Shadwick, R.E. & Goldbogen, J.A. (2021) Baleen whale lunge-feeding energetics near and away from the kinematic threshold of optimal efficiency. *Integrative and Organismal Biology*, 3 (1): obab005.
- Pirotta, E., Booth, C., **Cade, D.E.**, Calambokidis, J., Costa, D.P., Fahlbusch, J.A., Friedlaender, A.S., Goldbogen, J.A., Harwood, J., Hazen, E.L., New, L. & Southall, B.L. (2021) Context-dependent variability in the predicted daily energetic costs of disturbance in blue whales. *Conservation Physiology*, 9, coaa137.
- Cade, D.E.**, Carey, N., Domenici, P., Potvin, J. & Goldbogen, J.A. (2020) Predator-informed looming stimulus experiments reveal how large filter feeding whales capture highly maneuverable forage fish. *Proceedings of the National Academy of Sciences*, 117, 472-478.
- Flammang, B.E., Marras, S., Lehmkuhl, O., Anderson, E.J., Mukherjee, A., **Cade, D.E.**, Beckert, M., Nadler, J.H., Houzeaux, G., Vazquez, M., Amplo, H.E., Calambokidis, J., Friedlaender, A.S. & Goldbogen, J.A. (2020) Remoras pick where they stick and surf on blue whales. *Journal of Experimental Biology*. 223.
- Linsky, J.M.J., Wilson, N., **Cade, D.E.**, Goldbogen, J.A., Johnston, D.W. & Friedlaender, A.S. (2020) The scale of the whale: using video-tag data to evaluate sea ice concentration from the perspective of individual Antarctic minke whales. *Animal Biotelemetry*. 8:1-12.
- Oestreich, W.K., Fahlbusch, J.A., **Cade, D.E.**, Calambokidis, J., Margolina, T., Joseph, J., Friedlaender, A.S., McKenna, M.F., Stimpert, A.K., Southall, B.L., Goldbogen, J.A. & Ryan, J.P. (2020) Animal-borne measures of behavior enable acoustic detection of migration in dispersed populations. *Current Biology*. 30:1-7

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- Kahane-Rapport, S.R., Savoca, M.S., **Cade, D.E.**, Segre, P.S., Bierlich, K.C., Calambokidis, J., Dale, J., Friedlaender, A.S., Johnston, D., Werth, A.J. & Goldbogen, J.A. (2020) Lunge filter feeding biomechanics constrain rorqual foraging ecology across scale. ***Journal of Experimental Biology***, jeb.224196.
- Bamford, C.C.G., Kelly, N., Dalla Rosa, L., **Cade, D.E.**, Fretwell, P., Trathan, P.N., Cubaynes, H., Mesquita, A., Gerrish, L., Friedlaender, A.S. & Jackson, J.A. (2020) A comparison of baleen whale density estimates derived from overlapping satellite imagery and a shipborne survey. ***Scientific Reports***, 10, 12985.
- Cade, D.E.**, Levenson, J.J., Cooper, B., de la Parra, R., Webb, D.H. & Dove, A. (2020) Whale sharks increase swimming effort while filter feeding, but appear to maintain high foraging efficiencies. ***Journal of Experimental Biology***, 223, jeb224402.
- Hein, A.M., Altshuler, D.L., **Cade, D.E.**, Liao, J.C., Martin, B.T. & Taylor, G.K. (2020) An algorithmic approach to natural behavior. ***Current Biology***, 30, R663-675.
- Potvin, J., **Cade, D.E.**, Werth, A.J., Shadwick, R.E. & Goldbogen, J.A. (2020). A Perfectly Inelastic Collision: Bulk Prey Engulfment by Baleen Whales and Dynamical Implications for the World's Largest Cetaceans. ***American Journal of Physics***, 88:851-863.
- Segre, P.S., Potvin, J., **Cade, D.E.**, Calambokidis, J., Di Clemente, J., Fish, F.E., Friedlaender, A.S., Gough, W.T., Johnson, M., Kahane-Rapport, S.R., Oliveira, C., Parks, S.E., Penry, G.S., Simon, M., Stimpert, A.K., Wiley, D.N., Madsen, P.T., Goldbogen J.A. (2020) Energetic and physical limitations on the breaching performance of large whales. ***eLife***, 9, e51760.
- Tackaberry, J.E., **Cade, D.E.**, Goldbogen, J., Wiley, D., Friedlaender, A.S., Stimpert, A. (2020) From a calf's perspective: Humpback whale nursing behavior on two US feeding grounds. ***PeerJ***, 8:e8538.
- Goldbogen, J.A., **Cade, D.E.**, Wisniewska, D.M., Potvin, J., Segre, P.S., Savoca, M.S., Hazen, E.L., Czapanskiy, M.F., Kahane-Rapport, S.R., DeRuiter, S.L., Gero, S., Tønnesen, P., Gough, W.T., Hanson, M.B., Holt, M., Jensen, F.H., Simon, M., Stimpert, A.K., Arranz, P., Johnston, D.W., Nowacek, D.P., Parks, S.E., Visser, F., Friedlaender, A.S., Tyack, P.L., Madsen, P.T. & Pyenson, N.D. (2019a) Why whales are big but not bigger: Physiological drivers and ecological limits in the age of ocean giants. ***Science***, 366, 1367-1372.
- Goldbogen, J.A., **Cade, D.E.**, Calambokidis, J., Czapanskiy, M.F., Fahlbusch, J., Friedlaender, A.S., Gough, W.T., Kahane-Rapport, S.R., Savoca, M.S. & Ponganis, K.V. (2019b) Extreme bradycardia and tachycardia in the world's largest animal. ***Proceedings of the National Academy of Sciences***, 116, 25329-25332.
- Calambokidis, J., Fahlbusch, J.A., Szesciorka, A.R., Southall, B.L., **Cade, D.E.**, Friedlaender, A.S. & Goldbogen, J.A. (2019) Differential Vulnerability to Ship Strikes between Day and Night for Blue, Fin, and Humpback Whales Based on Dive and Movement Data from Medium Duration Archival Tags. ***Frontiers in Marine Science***, 6.
- Southall, B.L., DeRuiter, S.L., Friedlaender, A., Stimpert, A.K., Goldbogen, J.A., Hazen, E., Casey, C., Fregosi, S., **Cade, D.E.** & Allen, A.N. (2019) Behavioral responses of individual blue whales (*Balaenoptera musculus*) to mid-frequency military sonar. ***Journal of Experimental Biology***, 222, jeb190637.

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- Friedlaender, A.S., Bowers, M.T., **Cade, D.E.**, Hazen, E.L., Stimpert, A.K., Allen, A.N., Calambokidis, J., Fahlbusch, J., Segre, P. & Visser, F. (2019) The advantages of diving deep: Fin whales quadruple their energy intake when targeting deep krill patches. ***Functional Ecology***.
- Gough, W.T., Segre, P.S., Bierlich, K., **Cade, D.E.**, Potvin, J., Fish, F.E., Dale, J., di Clemente, J., Friedlaender, A.S., Johnston, D.W., Kahane-Rapport, S.R., Kennedy, J., Long, J., Oudejans, M., Penry, G.S., Savoca, M.S., Simon, M., Videsen, S., Visser, F., Wiley, D. & Goldbogen, J.A. (2019) Scaling of swimming performance in baleen whales. ***Journal of Experimental Biology***, 222, jeb. 204172..
- Segre, P.S., **Cade, D.E.**, Calambokidis, J., Fish, F.E., Friedlaender, A.S., Potvin, J. & Goldbogen, J.A. (2019) Body flexibility enhances maneuverability in the world's largest predator. ***Integrative and comparative biology***, 59, 48-60.
- Cade, D.E.**, Barr, K.R., Calambokidis, J., Friedlaender, A.S. & Goldbogen, J.A. (2018) Determining forward speed from accelerometer jiggle in aquatic environments. ***Journal of Experimental Biology***, 221, jeb. 170449.
- Werth, A.J., Potvin, J., Shadwick, R.E., Jensen, M.M., **Cade, D.E.** & Goldbogen, J.A. (2018) Filtration area scaling and evolution in mysticetes: trophic niche partitioning and the curious cases of sei and pygmy right whales. ***Biological Journal of the Linnean Society***, 125, 264-279.
- Goldbogen, J.A., **Cade, D.E.**, Calambokidis, J., Friedlaender, A.S., Potvin, J., Segre, P.S. & Werth, A.J. (2017a) How Baleen Whales Feed: The Biomechanics of Engulfment and Filtration. ***Annual Review of Marine Science***, 9, 1-20.
- Goldbogen, J.A., **Cade, D.E.**, Boersma, A.T., Calambokidis, J., Kahane-Rapport, S.R., Segre, P.S., Stimpert, A.K. & Friedlaender, A.S. (2017b) Using Digital Tags With Integrated Video and Inertial Sensors to Study Moving Morphology and Associated Function in Large Aquatic Vertebrates. ***The Anatomical Record***, 300, 1935-1941.
- Findlay, K.P., Seakamela, S.M., Meyer, M.A., Kirkman, S.P., Barendse, J., **Cade, D.E.**, Hurwitz, D., Kennedy, A., Kotze, P.G.H., McCue, S.A., Thornton, M., Vargas-Fonseca, O.A. & Wilke, C.G. (2017) Humpback whale "super-groups" – A novel low-latitude feeding behaviour of Southern Hemisphere humpback whales (*Megaptera novaeangliae*) in the Benguela Upwelling System. ***PloS one***, 12, e0172002.
- Friedlaender, A.S., Herbert-Read, J.E., Hazen, E.L., **Cade, D.E.**, Calambokidis, J., Southall, B.L., Stimpert, A.K. & Goldbogen, J.A. (2017) Context-dependent lateralized feeding strategies in blue whales. ***Current Biology***, 27, R1206-R1208.
- Cade, D.E.**, Friedlaender, A.S., Calambokidis, J. & Goldbogen, J.A. (2016) Kinematic Diversity in Rorqual Whale Feeding Mechanisms. ***Current Biology***, 26, 2617-2624.
- Segre, P.S., **Cade, D.E.**, Fish, F.E., Potvin, J., Allen, A.N., Calambokidis, J., Friedlaender, A.S. & Goldbogen, J.A. (2016) Hydrodynamic properties of fin whale flippers predict maximum rolling performance. ***Journal of Experimental Biology***, 219, 3315-3320.
- Cade, D.E.** & Benoit-Bird, K.J. (2015) Depths, migration rates and environmental associations of acoustic scattering layers in the Gulf of California. ***Deep Sea Research Part I: Oceanographic Research Papers***, 102, 78-89.

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Cade, D.E. & Benoit-Bird, K.J. (2014) An automatic and quantitative approach to the detection and tracking of acoustic scattering layers. *Limnology and Oceanography: Methods*, 12, 742-756.

PUBLICATIONS (submitted)

Cade, D.E., Kahane-Rapport, S.R., Wallis, B., Goldbogen, J. A. & Friedlaender, A.S. (in review) Size-selective predation by Antarctic humpback whales. *Frontiers in Marine Science*

Casey C, Weindorf S, Levy E, Linsky JM, Cade DE, Goldbogen JA, Nowacek DP, Friedlaender AS, in review. Acoustic signaling and associated behavior of Antarctic minke whales. **Royal Society Open Science**.

Mastick, N., Wiley, D., **Cade, D.E.**, Ware, C., Parks, S.E. & Friedlaender, A.S. (in review) Individual behaviors in changing group size of bubble-net feeding humpback whales in the southern Gulf of Maine. *Marine Mammal Science*.

Matika, A.F., Jourdain, E., **Cade, D.E.**, Karoliussen, R., Torello, A., & Hammond, P.S. (in review) Diving characteristics, energetics and prey profitability in herring-feeding killer whales (*Orcinus orca*) in northern Norway. *Marine Mammal Science*.

Nichols, R.C., **Cade, D.E.**, Kahane-Rapport, S.R., Goldbogen, J.A., Stimpert, A.K., Nowacek, D.P., Read, A.J., Johnston, D.W. & Friedlaender, A.S. (in review) Intra-seasonal variation in feeding rates and diel foraging behavior in a seasonally fasting mammal, the humpback whale. *Journal of Animal Ecology*.

Segre, P.S., Gough, W.T., Roualdes, E.A., **Cade, D.E.**, et al. (in review) Scaling of maneuvering performance in baleen whales. *Journal of Experimental Biology*

MANUSCRIPTS in final preparation

Cade, D.E., Goldbogen, J.A., Bierlich, K., Gough, W.T., Johnson, D., Kahane-Rapport, S.R., Nowacek, D., & Friedlaender, A.S. (in final preparation) Minimum body size constraints of engulfment filtration feeding

Nazario, E., **Cade, D.E.**, Bierlich, K.C., Calambokidis, J., Czapanskiy, M.F., Dale, J., Goldbogen, J.A., Johnston, D., Kahane-Rapport, S.R., Van der Hoop, J. & Friedlaender, A.S. Wild baleen whale inhalation variability revealed using animal borne video tags.

Tackaberry JE, Bérubé M, Cade DE, Friedlaender AS, Goldbogen JA, McDonald BI, Palsbøll PJ, Parks SE, Robbins J, Weinrich MT, Wiley DN, Stimpert AK, in prep. Humpback whale, *Megaptera novaeangliae*, feeding dynamics from the perspective of the individual: Insights from demography, life history, and bio-logging.

AWARDS

Early Career Award, International Bio-logging Society, 2021, “Recognizes early-career researchers who are challenging themselves, or the field, and are making significant contributions to advancing bio-logging science through innovative projects”

Anne T. and Robert M. Bass Fellowship, Stanford University, 2014-2017

Outstanding Achievement Award, Hopkins Marine Station, 2014

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RESEARCH GRANTS

NSF-OPP grant # 1643877, project collaborator

San Francisco and Monterey American Cetacean Society Research Grants, 2017, 2016, 2015

Defense University Research Instrumentation Program, project collaborator, 2016

Meyers Ocean Trust Student Research Award, 2016

NSF Post-doctoral fellowship proposal review (not funded):

- Regarding broader impacts: “This proposal has the strongest educational and outreach components of any proposal I read. Maybe ever.... it is unreasonable to expect more from any proposal.”
- Regarding research: “The PI has a unique combination of quantitative skills, field research skills, and teaching experience and interest.”

ACADEMIC MENTORING

Mentoring coordination:

Salinas High School/Hopkins Marine Station Mentoring Program Coordinator, 2015-2019

Direct supervision:

Julie Fukunaga, Stanford Undergraduate, 2017. See Cade, Seakamela et al., 2021

Kaela Montano, Ashley Guido, Salinas High School students, 2016-2017

Julianne Eitoku, Sandra Bautista, Salinas High School students, 2015-2016

Marisa Roth, Stanford Undergraduate, 2015

Indirect supervision:

Advise and train graduate and undergraduate students at Stanford and UC Santa Cruz

PEER REVIEW

60+ peer reviews. See [publons profile](#). Journals:

Journal of Experimental Biology

Plos One

PeerJ

ICES Journal of Marine Science

Proceedings B: Biological Sciences

Marine Mammal Science

Antarctic Science

Methods in Ecology and Evolution

Zoology

Functional Ecology

Marine Ecology Progress Series

Royal Society Open Science

Oceanography

Progress in Oceanography

Endangered Species Research

Scientific Reports

Aquatic Mammals

Journal of Marine Science and Engineering

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INVITED LECTURES & SYMPOSIA

Inertial sensing workshop, lead presenter/organizer	2020
Cabrillo Whale Watch Naturalist – Invited Seminar	2020
Pacific Grove Museum of Natural History – Invited Seminar	2017/2020
California Ocean Alliance – Marine Mammal Scientist Training Program (x5)	2018/2019
UC Santa Cruz – Biology of Marine Mammals Guest Lecture	2018
Moss Landing Marine Labs – Invited Seminar	2017
Aarhus University – Inertial Sensing Workshop Guest Lecture	2017
Weber State University Arts Integration Conference – Co-keynote speaker	2017
Lincoln High School (San Francisco) Marine Biology – Guest Lecture	2017
Point Reyes National Seashore Docent Training – Invited Seminar	2016
Biennial International American Cetacean Society Conference – Invited Talk	2016
Cal State University-Monterey Bay – Invited Seminar	2016
American Cetacean Society SF Bay – Invited Seminar	2016
American Cetacean Society Monterey Bay – Invited Seminar	2016
Cal State University-Monterey Bay – Marine Conservation Guest Lecture	2015
Moss Landing Marine Labs – Marine Acoustics Guest Lecture	2014

CONFERENCE PROCEEDINGS (SELECTED)

First author presentations

The 7 th International Bio-logging Science Symposium, Virtual	2021
Ocean Sciences meeting, San Diego, CA	2020
Society for Integrative and Comparative Biology, Austin, TX	2020
World Marine Mammal Conference, Barcelona, SP	2019
Society for Integrative and Comparative Biology, San Francisco, CA	2018
Biennial Conference of the Biology of Marine Mammals, Halifax, NS	2017
CA Student Chapter of the Society for Marine Mammalogy, Moss Landing, CA	2017
Biennial Conference of the Biology of Marine Mammals, San Francisco, CA	2015
NW Student Chapter of the Society for Marine Mammalogy, Corvallis, OR	2015
Acoustics Society of America, Indianapolis, IN	2014

First author posters

The 6 th International Bio-logging Science Symposium, Konstanz, Germany	2017
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Co-authored presentations

(7) The 7 th International Bio-logging Science Symposium, Virtual	
(4) Ocean Sciences meeting, San Diego, CA	2020
Society for Integrative and Comparative Biology, Austin, TX	2020

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(13) World Marine Mammal Conference, Barcelona, SP	2019
(2) Society for Integrative and Comparative Biology, San Francisco, CA	2018
(6) Biennial Conference of the Biology of Marine Mammals, Halifax, NS	2017
Acoustics Society of America, Honolulu, HI	2016

RELEVANT FIELD EXPERTISE

Current CI on US NMFS marine mammal permits 23095, 20430, and 21678

- Authorized to conduct cetacean field research in US and Antarctic waters
- 7+ years experience with suction cup and dart-attached tagging, biopsy sampling, UAV work, behavioral observation and small boat operation
- Placed, processed and/or supervised over 400 video/accelerometer tag deployments
- Level II disentanglement response training

Chief scientist/PI for cetacean field studies

Antarctic, March 2020

Monterey Bay, 2016-2018

Ten years of field studies in diverse environments collaborating with 15+ institutions including:

Antarctic (3 seasons) 2018-2020

Monterey Bay, CA (7 seasons) 2014-2021

Washington (4 seasons) 2015-2021

Azores, Portugal (4 seasons) 2015-2021

Cape Cod, MA (3 seasons) 2015-2017

So. California (5 seasons) 2013-2017

Svalbard, Norway (1 season) 2016

Andenes, Norway (1 season) 2016

Western South Africa (1 season) 2015

Newfoundland Coast (1 season) 2015

Oregon Coast (1 season) 2012

Gulf of California (1 season) 2011

Wilderness First Responder (WFR) and CPR certification (WMI/Stanford), exp June 2021

SCUBA certification (assistant instructor, NAUI)

4 seasons research diving with REEF check (2008-2010, 2015)

SELECTED MEDIA COLLABORATIONS

American Museum of Natural History ([curriculum](#)) ([videos](#))

Media for PNAS anchovy manuscript: ([NPR](#)) ([phys.org](#)) ([others](#))

Media for PNAS heart rate manuscript: ([quirks and quarks](#)) ([San Jose Mercury news](#)) ([>200 other](#))

Media for Cade et al 2016: ([video abstract](#)) ([Stanford](#)) ([Daily Planet Canada](#)) ([Gizmodo](#))

Others: ([Science Magazine for SMM 2017](#)) ([Monga Bay](#)) ([Outreach blog](#))

Passive acoustics work with MBNMS: ([local news link](#)) ([outreach video](#))

REFERENCES

Jeremy Goldbogen, Assistant Professor of Biology, Stanford University

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Elliott Hazen, Research Ecologist, NOAA Southwest fisheries, Adjunct Professor, UCSC
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