

Cynthia Aileen Catton

Bodega Marine Laboratory, UC Davis
2099 Westside Road, Bodega Bay, CA 94923
Email: cacatton@ucdavis.edu

EDUCATION

- 2008 PhD Marine Biology, Scripps Institution of Oceanography, UC San Diego
2008 M.S. Marine Biology, Scripps Institution of Oceanography, UC San Diego
2000 B.S. Zoology, University of Washington
1994 Roosevelt High School, Seattle, Washington

Doctoral Dissertation (2002-2008)

The influence of aggregation characteristics on low-density population dynamics of pink abalone (*Haliotis corrugata*), red abalone (*H. rufescens*), and wavy turban snails (*Megastrea undosa*) in California

RESEARCH EXPERIENCE

- 2019-present Environmental Planner 5 – National Estuary Program Habitat Strategic Initiative, Washington Department of Natural Resources
2017-present Research Associate – Marine invertebrate fisheries and conservation
Bodega Marine Laboratory, University of California, Davis
2012-2019 Environmental Scientist – Marine invertebrate fisheries and conservation
Marine Region, California Department of Fish and Wildlife (CDFW)
2012 Staff Research Associate II – Endangered white abalone conservation
Bodega Marine Laboratory, University of California, Davis
2010-2011 Research Contractor – Endangered black abalone conservation modeling
Southwest Fisheries Science Center, La Jolla,
National Oceanic and Atmospheric Administration (NOAA)
2009-2010 Postdoctoral Associate – Black abalone population dynamics
National Research Council
Southwest Fisheries Science Center, La Jolla, NOAA
2002-2008 Doctoral Student Researcher – Fisheries and conservation ecology
Scripps Institution of Oceanography, University of California, San Diego
2002 Research Technician – Marine ecology and larval biology
Lincoln Marine Science Center, Flinders University of South Australia
2000-2002 Research Technician – Marine ecology
Friday Harbor Laboratories, University of Washington
2001-2002 Collections Assistant Manager
Friday Harbor Laboratories, University of Washington
1996-1997 Intern Coordinator – Polluted Waters Project
Puget Soundkeeper's Alliance, Seattle, Washington
1995-1996 Intern – Water quality and riparian restoration
IMAPAL Foundation, Seattle, Washington

TEACHING EXPERIENCE

- 2007-2010 Guest instructor – Marine Invertebrates, University of California, San Diego
2007 Teaching assistant – Marine Biology, University of California, San Diego
2008 Guest instructor – Marine Invertebrates, University of San Diego

- 2004, 2005 Guest instructor – Scientific Underwater Data Collection, University of California, Davis
- 2001, 2002 Teaching assistant – Marine Invertebrate Zoology and Botany
Friday Harbor Labs, University of Washington
- 1993-2000 Water Safety Instructor – Parks and Recreation, City of Seattle

PEER-REVIEWED PUBLICATIONS

- Rogers-Bennett, L., and **C. A. Catton**. (2019) Marine heat wave and multiple stressors tip bull kelp forest to sea urchin barrens. *Scientific reports* 9(1):1-9.
- Kawana, S. K., **Catton, C. A.**, Hofmeister, J. K., Juhasz, C. I., Taniguchi, I. K., Stein, D. M., & Rogers-Bennett, L. (2019). Warm Water Shifts Abalone Recruitment and Sea Urchin Diversity in Southern California: Implications for Climate-Ready Abalone Restoration Planning. *Journal of Shellfish Research*. 38(2):475-484.
- Rogers-Bennett, L., Kashiwada, J. V., Taniguchi, I. K., Kawana, S. K., & **Catton, C. A.** (2019). Using density-based fishery management strategies to respond to mass mortality events. *Journal of Shellfish Research*. 38(2):485-495.
- Hofmeister, J.K.K., Kawana, S.K., Walker, B.J., **Catton, C.A.**, Taniguchi, I., Stein, D.M., Sowul, K. and L. Rogers-Bennett. (2018) Temporal and spatial patterns in behavioral responses of marine predators to a sudden influx of abalone prey (*Haliotis rufescens*). *Hydrobiologia* 813(1):123-136.
- Reid, J., L. Rogers-Bennett, M. Pace, R. Eyler, F. Vasquez, A. Bruner, **C. A. Catton**, J. V. Kashiwada, and I. K. Taniguchi. (2017) The economic value of the recreational red abalone fishery in northern California. *California Fish & Game*. 102(3):119-130.
- Catton, C.A.**, Stierhoff, K., and L. Rogers-Bennett (2016) Population status assessment and restoration modeling of white abalone (*Haliotis sorenseni*) in California. *Journal of Shellfish Research*. 35:601-610.
- Rogers-Bennett, L., Aquilino, K.M., **Catton, C.A.**, Kawana, S.K., Walker, B.J., Ashlock, L.W., Marshman, B.C., Moore, J.D., Taniguchi, I.K., Gilardi, K.V., and G.N. Cherr (2016) Implementing a restoration program for the endangered white abalone (*Haliotis sorenseni*) in California. *Journal of Shellfish Research*. 35:611-618.
- Rogers-Bennett, L., Dondanville, R. F., **Catton, C.A.**, Juhasz, C.I., Horii, T., and M. Hamaguchi (2016) Detecting larval, newly-settled, and juvenile red abalone (*Haliotis rufescens*) recruitment in northern California. *Journal of Shellfish Research*. 35:601-610.
- Braje, T.J., Torben, R.C., Erlandson, J.M., Rogers-Bennett, L., and **C. Catton** (2015) Historical ecology can inform restoration site selection: The case of black abalone (*Haliotis cracherodii*) along California's Channel Islands. *Aquatic Conservation: Marine and Freshwater Ecosystems*. DOI: 10.1002/aqc.2561
- Catton, C.A.** and L. Rogers-Bennett (2013) Assessing the recovery of pink abalone (*Haliotis corrugata*) by incorporating aggregation into a matrix model. *Journal of Shellfish Research*. 32:181-187.
- Arellano, S., Reitzel, A., and **C. (Catton) Button** (2012). Stage-specific variation in vertical

distribution of larvae relative to halocline cues. *Journal of Experimental Marine Biology and Ecology*. 414- 415:28-37.

(Catton) Button, C.A. and L. Rogers-Bennett (2011) Vital rates of pink abalone *Haliotis corrugata* estimated from mark-recapture data to inform recovery. *Marine Ecology Progress Series*. 431:151-161

OUTREACH MATERIALS, TECHNICAL REPORTS, AND PLANS

Hohman, R., Hutto, S., **Catton, C.** and F. Koe. (2019) *Sonoma-Mendocino Bull Kelp Recovery Plan*. Plan for the Greater Farallones National Marine Sanctuary and the California Department of Fish and Wildlife. San Francisco, CA. 166 pp.

Catton, C.A., Amrhein, A., and L. Rogers-Bennett (2016) “Perfect Storm” Decimates Northern California Kelp Forests. California Department of Fish and Wildlife Marine Management News. <https://cdfwmarine.wordpress.com/2016/03/30/perfect-storm-decimates-kelp/>

Rogers-Bennett, L. and **C. Catton** (2013) *California Red Abalone: A guide to understanding the essentials of abalone biology and their relation to recreational red abalone fishing regulations*. California Department of Fish and Wildlife and California SeaGrant. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=76527&inline>

Rogers-Bennett, L., **Catton, C.**, and I. Taniguchi (2013) *Estimating red abalone density for managing California’s recreational red abalone fishery*. California Department of Fish and Wildlife.

Catton, C. and I. Taniguchi (2013) Annual Abalone Fisheries Report. *In: 2013 California Legislative Fisheries Forum: Department of Fish and Game Annual Marine Fisheries Report*. California Department of Fish and Game.

(Catton) Button, C. and I. Taniguchi (2012) Annual Abalone Fisheries Report. *In: 2012 California Legislative Fisheries Forum: Department of Fish and Game Annual Marine Fisheries Report*. California Department of Fish and Game.

(Catton) Button, C., Rogers-Bennett, L., Taniguchi, I., Kashiwada, J., and C. Juhasz. (2012) *San Miguel Island Red Abalone Fishery Consideration – Recommendation*. Report to the California Fish and Game Commission. California Department of Fish and Game.

Dethier, M. and **C. Catton** (2000) *Illustrated guide to juvenile clams of Puget Sound*. University of Washington. Friday Harbor, Washington.

Catton, C. and L. Krueger (1997) *Longfellow Creek*. Polluted Waters Report. Puget SoundKeeper Alliance, Seattle, Washington.

Catton, C. and K. Anthony (1997) *Joe’s Creek*. Polluted Waters Report. Puget SoundKeeper Alliance, Seattle, Washington.

INVITED PROFESSIONAL TALKS

Catton, C. (2020) Causes and Consequences of Recent Large-Scale Kelp Loss in Northern California. Washington Department of Fish and Wildlife. February 2020.

Catton, C. and L. Gier (2019) Accelerating Puget Sound Recovery: NEP Habitat Strategic Initiative. Washington Department of Natural Resources. November, 2019.

Catton, C. (2019) Guiding Kelp Restoration Actions in Northern California through Multidisciplinary

Science & Community Engagement. Moss Landing Marine Labs. March 2019.

- Catton, C.** (2017) Eyes on the Horizon: Examining the Scale of Fisheries Management in a Changing Climate and the Need for Multi-Institutional Collaborations. American Fisheries Society. Eureka, CA. March 2017
- Catton, C.,** Rogers-Bennett, L., Juhasz, C., Walker, B., Kashiwada, J., Kawana, S., and A. Maguire (2015) Kelp forests pushed beyond a tipping point. California Cooperative Fisheries and Oceanography Investigations El Niño workshop, Monterey, CA. December 2015
- Catton, C.** (2013) Abalone and Allee Effects: Implications for management and conservation. John and Mary Louise Riley Seminar Series, Bodega Marine Laboratory, Bodega Bay, CA. March 2013
- (Catton) Button, C.** (2011) Population viability of the California black abalone. National Oceanic and Atmospheric Administration, La Jolla, CA. March 2011

CONTRIBUTED PROFESSIONAL TALKS

- Catton, C.A.,** Kawana, S.K., Kashiwada, J., Winkvist, T., Sowul, K., and L. Rogers-Bennett (2018) Large-scale urchin barrens in Northern California persist and recruit despite severe starvation conditions. Western Society of Naturalists. Tacoma, WA. November, 2018.
- Catton, C.A.,** Kawana, S.K., Kashiwada, J., Winkvist, T., Sowul, K., Genhart-Stiehler, G.R., Grinshpan, A., Bray, J., Koike, S., Slatoff, L.G., and L. Rogers-Bennett (2017) Development and persistence of large-scale purple urchin barrens in Northern California. Western Society of Naturalists. Pasadena, CA. November, 2017.
- Rogers-Bennett, L., **Catton, C.,** Kawana, S., Winkvist, T., Sowul, K., Kashiwada, J. (2017) Catastrophic impacts of a marine heat wave on kelp forests, abalone and nearshore fisheries in northern California. Western Society of Naturalists. Pasadena, CA. November, 2017.
- Sowul, K., Rogers-Bennett, L., Winkvist, T., Bray, J., Genhart-Stiehler, G., Koike, S., and **C. Catton** (2017) Assessing the condition of wild red abalone and their potential for recovery following severe ocean warming. Western Society of Naturalists. Pasadena, CA. November, 2017.
- Kawana, S.K., **Catton, C.A.,** Hofmeister, J., Juhasz, C., Taniguchi, I., Stein, D., and L. Rogers-Bennett (2018) Abalone and sea urchin recruitment during normal and warm-water in Southern California: Implications for future abalone recovery. International Abalone Symposium. Xiamen, China. May, 2018.
- Catton, C.,** Rogers-Bennett, L., Juhasz, C., Kashiwada, J., Kawana, S., and A. Maguire. (2015) Impacts of recent warming events on red abalone (*Haliotis rufescens*) reproduction and recruitment in northern California. Western Society of Naturalists. Sacramento, CA. November, 2015.
- Rogers-Bennett, L., **Catton, C.,** Juhasz, C., Kashiwada, J., Kawana, S., and A. Maguire (2015) Kelp forest monitoring reveals changes from HABs, sea star disease, purple urchin explosions, and El Niño in northern California. Western Society of Naturalists, Sacramento, CA. November, 2015.
- Catton, C.,** Slatoff, L., Huff, S., Gaylord, B., and L. Rogers-Bennett (2015) Impacts of marine bio-eroding species on shell strength of red abalone: Implications for incidental fishing mortality.

- California Department of Fish and Wildlife Science Symposium. Davis, CA. October, 2015.
- Catton, C.,** Stierhoff, K., and L. Rogers-Bennett (2015) Modeling restoration of the endangered white abalone populations in California. International Abalone Symposium. Yeosu, Korea. October, 2015.
- Catton, C.,** Lessard, J., and L. Rogers-Bennett (2015) At risk or on the rise? Characterizing northern abalone populations across a broad geographic range. International Abalone Symposium, Yeosu, Korea. October, 2015.
- Catton, C.,** Lessard, J., and L. Rogers-Bennett (2015) Characterizing northern abalone populations across a broad geographic range: Perspectives on endangered listing consideration. National Shellfisheries Association, Monterey, CA. March, 2015.
- Catton, C.** (2014) Red abalone recreational fishery. California Cooperative Oceanic Fisheries Investigations, La Jolla, CA. December, 2014.
- Catton, C.,** Lessard, J., and L. Rogers-Bennett (2014) Characterizing northern abalone populations across a broad geographic range: Perspectives on endangered listing consideration. Western Society of Naturalists, Tacoma, CA. November, 2014.
- Catton, C.,** Rogers-Bennett, L., and J. Leichter (2013) Density-dependence of aggregation in abalone populations: Evidence for Allee Effects. Western Society of Naturalists, Oxnard, CA. November, 2013.
- Catton, C.A.** and L. Rogers-Bennett (2012) Assessing the recovery of pink abalone (*Haliotis corrugata*) by incorporating aggregation into a matrix model. Western Society of Naturalists, Monterey, CA. November, 2012.
- (Catton) Button, C.A.** and L. Rogers-Bennett (2012) Assessing the recovery of *Haliotis corrugata* by incorporating aggregation into a matrix model. International Abalone Symposium, Hobart, Tasmania, Australia. May, 2012.
- (Catton) Button, C.** and L. Rogers-Bennett (2009) The use of nearest-neighbor distance, aggregation size, and population density estimation methods in developing biological reference points. International Abalone Symposium, Pattaya, Thailand. July, 2009.
- (Catton) Button, C.** (2006) Current status of a pink abalone population near San Diego, CA. Western Society of Naturalists. November, 2006.

CONTRIBUTED PROFESSIONAL POSTERS

- Koike, S., **Catton, C.A.,** Bray, J., Klamt, B., and L. Rogers Bennett (2017) Kelp deforestation impacts health and reproduction of red abalone in Northern California. Western Society of Naturalists. Pasadena, CA. November, 2017
- Catton, C.A.,** Kawana, S.K., Kashiwada, J., Winquist, T., Maguire, A., and L. Rogers-Bennett (2016) Recent Unprecedented Purple Urchin Population Boom In Northern California Razes Algal Species And Exposes Bare Rock Reef. Western Society of Naturalists. Monterey, CA. November 2016.
- Walker, B.J., **Catton, C.A.** and L. Rogers-Bennett (2015) Critical temperature thresholds can be used to select optimal white abalone outplanting sites. National Shellfisheries Association, Monterey, CA. March 2015

- Walker, B.J., **Catton, C.A.** and L. Rogers-Bennett (2015) Critical temperature thresholds can be used to select optimal white abalone outplanting sites. Western Society of Naturalists, Tacoma, CA. November 2014
- Makukhov, A.D., Rogers-Bennett, L., **Catton, C.A.**, Micheli, F., and J.K. O’Leary (2014) Initial assessment of larval settlement in low density abalone populations in Monterey Bay, California. Ecological Society of America, Sacramento, CA. August 2014
- Kawana, S.K., **Catton, C.A.**, and L. Rogers-Bennett (2013) Distribution of the boring sponge, *Cliona celata*, infecting the red abalone fishery in northern California. Western Society of Naturalists, Oxnard, CA. November, 2013
- (Catton) Button, C.A.**, Rogers-Bennett, L., Juhasz, C., and I. Taniguchi (2013) Modeling restoration of endangered white abalone (*Haliotis sorenseni*) populations. California Department of Fish and Wildlife Science Symposium, Sacramento, CA. October, 2013
- Catton, C.A.**, Rogers-Bennett, L., Juhasz, C., and I. Taniguchi (2012) Modeling restoration of endangered white abalone (*Haliotis sorenseni*) populations. Western Society of Naturalists, Monterey, CA. November, 2012
- Aquilino, K.M., McGinn, N.A., **Catton, C.A.**, Rogers-Bennett, L., Moore, J.D., and G.N. Cherr (2012) White abalone (*Haliotis sorenseni*) captive breeding program. Western Society of Naturalists, Monterey, CA. November, 2012
- Catton, C.** (2005) Temperature effects on the larval duration of the Wavy Turban Snail, *Megastrea undosa* (Wood, 1828) (Gastropoda: Turbinidae). Society of Integrative and Comparative Biology, San Diego, CA. January, 2005.
- Catton, C.**, Haaker, P, and I. Taniguchi (2004) Is density an effective population evaluation criterion for aggregative species? A Case study of a pink abalone, *Haliotis corrugata*, population near San Diego, California. Western Society of Naturalists, November, 2004.
- Catton, C.** (2003) Exploited invertebrates from southern California kelp forests: Considerations for management and conservation. Center for Marine Biodiversity and Conservation, December, 2003.
- Catton, C.** (2002) Life history stages of *Eusyllis habeii* Imajima, 1966 with notes on epitoky in the family Syllidae (Annelida: Polychaeta). Society of Integrative and Comparative Biology, Anaheim, CA. January, 2002.

EDUCATION & OUTREACH PRESENTATIONS

- Catton, C.** (2016) Recent kelp losses impact fisheries in northern California. Point Arena Library, Point Arena CA, December 2016
- Catton, C.** (2016) Recent kelp losses impact fisheries in northern California. Science Uncorked at Gourmet au Bay, Bodega Bay CA, December 2016
- Catton, C.** (2016) North coast bull kelp forest: Status update. California Fish and Game Commission Marine Resources Committee, Santa Rosa CA, July 2016
- Catton, C.** (2016) North coast abalone and urchin fisheries at risk? California Fish and Game Commission, Sacramento CA, February 2016
- Catton, C.**, Lessard, J., and L. Rogers-Bennett (2015). At risk or on the rise? Pinto abalone

populations in northern California and beyond. Science Uncorked, Bodega Bay, CA. March, 2015

Catton, C. (2014) Red Abalone biology and management for enforcement. Allied Agency Meeting, Fort Ross, CA. March, 2014

(Catton) Button, C. (2013) Monitoring trends in red abalone reproduction. Recreational Red Abalone Advisory Committee meeting, San Francisco, CA. December, 2013

(Catton) Button, C. (2007) Population biology of two broadcast-spawning gastropods. San Diego Shell Club meeting. January, 2007

(Catton) Button, C. (2006) Current status of a pink abalone population near San Diego, CA. California Sea Urchin Commission meeting. December, 2006.

SERVICE

- Program Director – Kelp Ecosystem and Landscape Partnership for Research on Resilience (KELPRR), 2017-present
- Co-Chair – Kelp Recovery Working Group, CDFW and Greater Farallones National Marine Sanctuary, 2018
- Lead Editor, Red Abalone Fishery Management Plan – CDFW, 2015-present
- Representative for US and Canada – International Abalone Society, 2015-present
- Curriculum development committee – CDFW marine climate change college, 2014
- CDFW climate change working group, 2013-present
- Scheduler and Chair – Seminar Committee, Bodega Marine Laboratory, 2012-2014
- Diving Control Board Student Representative – Scripps Institution of Oceanography, 2003-2007
- Species Identification Club Coordinator – Scripps Institution of Oceanography, 2005
- Intertidal Monitoring Volunteer – Cabrillo National Monument, 2003-2005
- Subtidal Monitoring Volunteer – Friday Harbor Labs, University of Washington, 2000-2002

DOCTORAL COMMITTEES

- Kate Melanson, University of California Santa Cruz, 2017-present

REFEREE SERVICE

- North Pacific Research Board
- Journal of Shellfish Research
- Bulletin of Marine Science
- CalCOFI Reports
- Seafood Watch
- California SeaGrant

HONORS / AWARDS

- CDFW Science Institute - Featured Scientist May 2017
- National Research Council Postdoctoral Fellowship 2009-2010

- Wyer Fellowship 2007-2008
- Halliday Field Research Grant 2007
- Hicks Fellowship 2007-2008
- Coastal Environmental Quality Initiative Graduate Fellowship 2006
- California Sea Grant Trainee 2002-2005
- Western Society of Naturalists, Best Student Poster Award 2004
- Dr. Mia J. Tegner Fund Research Grant 2003, 2004
- Edna B. Sussman Internship Funding 2002-2005
- NSF Research Experience for Undergraduates Fellowship 1999

CONTRACTS

2016-2018 NOAA Section 6 “Next Steps in White Abalone Recovery: A Partnership for Wild Population Restoration Stocking” PIs Taniguchi, Rogers-Bennett, Moore, **Catton**, Gilardi, and Burton \$4,287,437.

CERTIFICATIONS

- California Boating Safety – 2015
- Washington Boating Safety – 2014
- CDFW Scientific Diver – 2013
- Standard 1st Aid – 2016
- Adult and child CPR – 2016
- CDFW Scuba Compressor Operator – 2012
- AAUS Scientific Diver – 1999
- PADI Rescue Diver #9804081456 – 1997
- PADI Advanced Open Water #9509294676 – 1995
- NAUI Open Water I – 1993

PROFESSIONAL MEMBERSHIPS

American Academy of Underwater Sciences
American Fisheries Society
International Abalone Society
National Shellfisheries Association
Western Society of Naturalists