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EDUCATION

2004 Ph.D. Marine Biology, Boston Univ. Marine Program, Marine Biological Laboratory
2000 Shellfish Aquaculture Proficiency Certificate, Sea Grant Fisheries Program
1998 M.A. Marine Biology, Boston Univ. Marine Program, Marine Biological Laboratory
1993 B.A. Biology with honors, University of Chicago

PROFESSIONAL ACTIVITIES

2007-present Senior Marine Scientist, Dauphin Island Sea Lab, Dauphin Island, AL
2018- present Professor of Marine Sciences, University of South Alabama, Mobile, AL
2013-2018 Associate Professor of Marine Sciences, University of South Alabama, Mobile, AL.
2007-2013 Assistant Professor of Marine Sciences, University of South Alabama, Mobile, AL.
2004-2006 Assistant Professor of Marine Biology, University of Maine at Machias.
2003-2004 Research Associate/ Consultant, Cape Cod, MA.
1995-2004 Teaching Fellow/Research Assistant, Boston University Marine Program, MA.

RESEARCH INTERESTS

My research focuses on place-based applied studies that define and seek mechanistic understanding of anthropogenic effects on coastal ecosystems by quantifying effects on habitat, food resources, and the biology and physiology of target organisms.

SELECTED PUBLICATIONS

Peer reviewed journals and books:

In revision M. Hodanbosi, N. Wingers, M. Russell, **R.H. Carmichael**. Human influence on common bottlenose dolphin (*Tursiops truncatus*) strandings in the northern Gulf of Mexico. *Frontiers* (G)

In revision **Carmichael, R.H.** and H. Patterson. Stable isotope composition of weathered MC252 oil: Implications for tracing oil degradation and bioassimilation. *Environ. Sci. Technol.*

In revision DaCosta, K., Y. Chiari, **R.H. Carmichael**. Effects of range expansion on population structure and connectivity: the example of the Florida manatee. *Mammalian Biol.* (G)

Submitted Cloyed, C., E. Hieb, K. DaCosta, M. Ross, **R.H. Carmichael**. Habitat selection and abundance of West Indian Manatees (*Trichechus manatus*) at the margins of their expanding range. *J. Animal Ecol.* (P)

Submitted Russell, M., J. Bloodgood, **R.H. Carmichael**. Spatial, temporal and demographic patterns of cetacean strandings in northcentral Gulf of Mexico. *J. Cetacean Res. Manage.* (T)

- In press Bloodgood, J., M. Russell, C. Clark, E. Hieb, **R.H. Carmichael**. From monitoring to final disposition, collaborative response to the first live sperm whale (*Physeter macrocephalus*) stranding in Alabama, USA. *Aquatic Mammals* (P)
- 2021 Frith, A., J. Henseler, S. Badri, K. Calci, A. Stenson, **R.H. Carmichael***. Multiple indicators of wastewater contamination to shellfish farms near a tidal river. *Est. Coasts*. 1-15. doi: 10.1007/s12237-021-01033-x. [CESN highlight article](#) (G)
- 2021 Cloyed, C.S., R. Wilson, B. Balmer, A. Hohn, L. Schwacke, E. Zolman, M. Tumlin, R. Wells, A. Barleycorn, J. Allen, **R.H. Carmichael**. Specialization of a mobile, apex predator affects trophic coupling among adjacent habitats. *Sci. Rep.* 11:19611 (P)
- 2021 Cloyed, C.S., B. Balmer, L. Schwacke, A. Barleycorn, K. Mullin, P. Rosel, T. Rowles, C. Smith, F. Townsend, M. Tumlin, R. Wells, E. Zolman, **R.H. Carmichael**. Interaction between dietary and habitat niche breadth influences cetacean vulnerability to environmental disturbance. *Ecosphere*. 12(9):e03759 (P).
- 2021 Cloyed, C.S., Hieb, E., DaCosta, K., Ross, M., **Carmichael, R.H.** West Indian Manatees use partial migration to expand their geographic range into the northern Gulf of Mexico. *Front. Mar. Sci.* 1354. doi: 10.3389/fmars.2021.725837 (P)
- 2021 Gancel, H.N., **R.H. Carmichael**, J. Du, K. Park. Use of settlement patterns and geochemical tagging to test population connectivity of eastern oysters (*Crassostrea virginica*) in a freshwater-influenced estuary. *MEPS*. doi: 10.3354/meps13796 (G)
- 2021 Groet, T., Hieb, E., Darrow, E., **Carmichael, R.H.** Our Wastewater Footprint: Protecting Water Quality Through Comprehensive Coproduction of Knowledge. *Case Studies Environ.* doi: 10.1525/cse.2021.1425563 (G)
- 2021 Botton, M., A. John, **R.H. Carmichael**, F. Mohamad, P. Bhadury, J. Zaldívar-Rae, P. Shin, J. Tanacredi, S.G. Cheung. Horseshoe crabs: ‘Living fossils’ imperiled in the Anthropocene. *In Imperiled: The Encyclopedia of Conservation*, Elsevir, Ltd, UK. doi: 10.1016/B978-0-12-821139-7.00103-3.
- 2021 Grace, M.,... **R.H. Carmichael**, et al. Testing a global standard for quantifying species recovery and assessing conservation impact. *Conservation Biol.* doi: 10.1111/cobi.13756.
- 2021 Cloyed, C.S., B. Balmer, L. Schwacke, A. Barleycorn, K. Mullin, P. Rosel, T. Rowles, C. Smith, F. Townsend, M. Tumlin, R. Wells, E. Zolman, **R.H. Carmichael**. Linking patterns of morbillivirus exposure in dolphins to habitat use among sites that vary in environmental structure. *J. Animal Ecol.* 90:1191-1204. doi: 10.1111/1365-2656.13446 (P)
- 2021 Hieb, E., E. Eniang, L. Keith-Diagne, **R.H. Carmichael**. In-water bridge construction impacts on manatees with implications for marine megafauna species. *J Wildlife Manage.* 85: 674-685. doi: 10.1002/jwmg.22030 (T)
- 2021 Estes, M., **R.H. Carmichael**, X. Chen, S. Carter. Environmental factors and the occurrence of horseshoe crabs in the northcentral Gulf of Mexico. *PLOS One.* (G) 16(1): e0243478 (G^)
- 2020 Cloyed, C., K. DaCosta, M. Hodanbosi, **R. H. Carmichael**. The effects of lipid extraction on $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values across taxa, tissues, and trophic groups. *Methods Ecol. and Evol.* doi: 10.1111/2041-210X.13386 (P)
- 2020 Deming, A., N. Wingers, D. Moore, D. Rotstein, R. Wells, R. Ewing, M. Hodanbosi, **R.H. Carmichael**. Case Report: Health impacts and recovery from prolonged freshwater

- exposure in a common bottlenose dolphin (*Tursiops truncatus*). *Front. Vet. Sci.* doi: 10.3389/fvets.2020.00235 (P, DVM)
- 2019 Collins, M., **R.H. Carmichael**, D. Rotstein, J. Byrd, and A. Deming. Suspected broadhead arrow injuries in two common bottlenose dolphins (*Tursiops truncatus*) along the Alabama Coast. *Mar. Mam. Sci.* doi: 10.1111/mms.12667. (T)
- 2019 Murray, R., **R.H. Carmichael**, M. Collins, M. Russell, and A. Deming. Dead or Alive: Use of Elemental Analysis to Determine Status of Stranded Perinate Bottlenose Dolphins (*Tursiops truncatus*). *Gulf and Caribbean Res.* 30:SC28-32 (U[^])
- 2019 Sequeira, A., M. Heupel, M. Lea, V. Eguíluz, C. Duarte, M. Meekan, M. Thums, **R.H. Carmichael**, L. Ferreira, J. Fernandez-Gracia, R. Harcourt, I. Jonsen, C. McMahon, D. Sims, R. Wilson, G. Hays. The importance of sample size in animal tracking studies. *Ecol. Appl.* 0(0). E)1947.
- 2019 Cloyed, C., E. Hieb, M. Collins, K. DaCosta, **R.H. Carmichael**. Linking use of ship channels by West Indian manatees (*Trichechus manatus*) to seasonal migration and habitat use. *Front. Mar. Sci.* 6:318. doi:10.3389/fmars.2019.00318 (P)
- 2019 Gancel, H., **R.H. Carmichael**, K. Park, J.W. Krause, S. Rikard. Field mark-recapture of calcein stained larval oysters (*Crassostrea virginica*) in a freshwater dominated estuary. *Est. Coasts.* 42:1558-69 (G)
- 2019 Hays G., H. Bailey, S. Bograd, W. Bowen, C. Campagna, **R.H. Carmichael**, P. Casale, A. Chiaradia, D. Costa, E. Cuevas, P de Bruyn, M. Dias, C. Duarte, D. Dunn, P. Dutton, N. Esteban, A. Friedlaender, K. Goetz, B. Godley, P. Halpin, M. Hamann, N. Hammerschlag, R. Harcourt, A-L Harrison, E. Hazen, M. Heupel, E. Hoyt, N. Humphries, C. Kot, J. Lea, H. Marsh, S. Maxwell, C. McMahon, G. Notarbartolo di Sciarra, D. Palacios, R. Phillips, D. Righton, G. Schofield, J. Seminoff, C. Simpfendorfer, D. Sims, A. Takahashi, M. Tetley, M. Thums, P. Trathan, S. Villegas-Amtmann, R. Wells, S. Whiting, N. Wildermann, A. Sequeira. Translating marine animal tracking data into conservation policy and management. *Trends Ecol. Evol.* <https://doi.org/10.1016/j.tree.2019.01.009> Cover feature.
- 2018 Grüss, A., M. Drexler, C. Ainsworth, J. Roberts, **R.H. Carmichael**, N. P. Richards, E. Chancellor, E. Babcock, M. Love. Improving the spatial allocation of marine mammal and sea turtle biomasses in spatially-explicit ecosystem models. *Mar. Ecol. Prog. Ser.* 602:255-274.
- 2018 Patterson, H.K. and **R.H. Carmichael**. Dissolved oxygen affects $\delta^{15}\text{N}$ values in oyster tissues: Implications for stable isotope ecology. *Ecosphere.* 9:3 e02154 (G)
- 2018 Sequeira, A., J. Rodríguez, V. Eguíluz, R. Harcourt, M. Hindell, D. Sims, C. Duarte, D. Costa, J. Fernandez-Gracia, L. Ferreira, G. Hays, M. Heupe, M. Meekan, A. Aven, F. Bailleul, A. Baylis, M. Berumen, C. Braun, M. Caley, R. Campbell, **R. H. Carmichael**, E. Clua, L. Einoder, S. Goldsworthy, C. Guinet, J. Gunn, D. Hammer, N. Hammerschlag, M. Hammill, L. Hückstädt, N. Humphries, I. Jonsen, G. Skomal, M-A. Lea, A. Lowther, A. Mackay, E. McHuron, J. Mckenzie, L. McLeay, C. McMahon, K. Mengersen, M. Muelbert, A. Pagano, B. Page, N. Queiroz, P. Robinson, S. Shaffer, M. Shivji, S. Thorrold, S. Villegas-Amtmann, M. Weise, R. Wells, B. Wetherbee, A. Wiebkin, B. Wienecke, M. Thums. Convergence of movement patterns of marine megafauna in coastal and open oceans. *Proc. Natl. Acad. Sci.* p.201716137. Cover feature.

- 2018 D'Ambra, I., W.M. Graham, **R.H. Carmichael**, F. J. Hernandez, Jr. Dietary overlap between scyphomedusae and forage fish in the northern Gulf of Mexico. *Mar. Ecol. Prog. Ser.* 587:31-40. doi: 10.3354/meps12419 (G)
- 2017 Krause, J., E. Darrow, R. Pickering, **R.H. Carmichael**, A. Larson, J. Basaldua. Reactive Silica Fractions in Coastal Lagoon Sediments from the Northern Gulf of Mexico. *Cont. Shelf Res.* 151:8-14. doi:10.1016/j.csr.2017.09.014
- 2017 Hieb, E., **R.H. Carmichael**, A. Aven, C. Nelson-Seely, N. Taylor. Sighting demographics of the West Indian manatee (*Trichechus manatus*) in the north central Gulf of Mexico supported by citizen-sourced data. *Endanger. Species. Res.* 32:321-332. doi:10.3354/esr00817 (T)
- 2017 Fauquier, D. A., J. Litz, S. Sanchez, K. Colegrove, L. Schwacke, L. Hart, J. Saliki, C. Smith, T. Goldstein, S. Bowen-Stevens, W. McFee, E. Fougères, B. Mase-Guthrie, E. Stratton, R. Ewing, S. Venn-Watson, **R.H. Carmichael**, C. Clemons-Chevis, D. Shannon, S. Shippee, S. Smith, L. Staggs, M. Tumlin, N. Wingers, T. Rowles. Evaluation of morbillivirus exposure in cetaceans from the northern Gulf of Mexico 2010-2014. *Endanger. Species Res.* 33:211-220. doi:10.3354/esr00772
- 2017 Hohn, A., L. Thomas, **R.H. Carmichael**, C. Booth, J. Litz, D. Shannon, S. Shippee, C. Sinclair, S. Smith, T. Speakman, M. Tumlin, E. Zolman. Assigning stranded bottlenose dolphins to stock using stable isotope ratios following the Deepwater Horizon oil spill. *Endanger. Species Res.* 33:235-252. doi:10.3354/esr00783
- 2017 Darrow, E. S., **R.H. Carmichael**, C. F. T. Andrus, H. E. Jackson. From middens to modern estuaries, oyster shells sequester source-specific nitrogen. *Geochim Cosmochim. Ac.* 202:39-56. doi:10.1016/j.gca.2016.12.023 (G)
- 2016 Darrow, E. S., **R.H. Carmichael**, K. R. Calci, W. Burkhardt III. Land-use related changes to sedimentary organic matter in tidal creeks of the northern Gulf of Mexico. *Limnol. Oceanogr.* 62(2):686-705. doi:10.1002/lno.10453 (G)
- 2016 Patterson H. K. and **R.H. Carmichael**. The effect of lipid extraction on carbon and nitrogen stable isotope ratios in oyster tissues: Implications for glycogen-rich species. *Rapid Commun. Mass Sp.* 30(24): 2594-2600 (G)
- 2016 Oczkowski, A., T. Gumbley, B. Carter, **R.H. Carmichael**, A. Humphries. Establishing an anthropogenic nitrogen baseline using Native American shell middens. *Frontiers Mar. Sci.* doi:10.3389/fmars.2016.00079.
- 2016 Colegrove, K., S. Venn-Watson, J. Litz, M. J. Kinsel, K. A. Terio, E. Fougères, Ruth Ewing, D. A. Pabst, W. A. McLellan, S. Raverty, J. Saliki, S. Fire, G. Rappucci, S. Bowen-Stevens, L. Noble, A. Costidis, M. Barbieri, C. Field, S. Smith, **R.H. Carmichael**, C. Chevis, W. Hatchett, D. Shannon, M. Tumlin, G. Lovewell, W. McFee, T. Rowles. Fetal distress and *in utero* pneumonia in perinatal bottlenose dolphins (*Tursiops truncatus*) during the Northern Gulf of Mexico unusual mortality event: 2010 through 2013. *Dis. Aquat. Org.* 119:1-16.
- 2015 Estes, M. G., Jr., **R.H. Carmichael**, P. D. M. Macdonald, A. Brady, J. McFadyen. Molts reveal life-history patterns for juvenile American horseshoe crabs in fringe habitats. p. 255-278. In **R.H. Carmichael**, M. Botton, P.K.S. Shin, S.G. Cheung [eds.], *Changing Global Perspectives on Horseshoe Crab Biology, Conservation, and Management*, Springer, New York. (G)

- 2015 Botton, M., **R.H. Carmichael**, P. Shin, S. Cheung. Emerging issues in horseshoe crab conservation: A perspective from the IUCN species specialist group. p. 369-381. *In* **R.H. Carmichael**, M. Botton, P. K. S. Shin, S. G. Cheung [eds.], Changing Global Perspectives on Horseshoe Crab Biology, Conservation, and Management, Springer, New York.
- 2015 **Carmichael, R.H.***, E. Hieb, G. Gauvry, C.N. Shuster, Jr. Examination of large exuviae with mating scars: Do female American horseshoe crabs, *Limulus polyphemus*, molt after sexual maturity? p. 353-366. *In* **R.H. Carmichael**, M. Botton, P.K.S. Shin, S.G. Cheung [eds.], Changing Global Perspectives on Horseshoe Crab Biology, Conservation, and Management, Springer, New York.
- 2015 Hieb, E. E., J. Baggett, A. Aven, **R.H. Carmichael***. Effects of sediment type and tank shape on horseshoe crab (*Limulus polyphemus*) growth and survival in culture. p. 289-302. *In* **R.H. Carmichael**, M. Botton, P.K.S. Shin, S.G. Cheung [eds.], Changing Global Perspectives on Horseshoe Crab Biology, Conservation, and Management, Springer, New York. (T)
- 2015 Gauvry, G. and **R.H. Carmichael**. Young voices: Through the arts, future environmental stewards have a global voice. p. 587-593. *In* **R.H. Carmichael**, M. Botton, P.K.S. Shin, S.G. Cheung [eds.], Changing Global Perspectives on Horseshoe Crab Biology, Conservation, and Management, Springer, New York.
- 2015 Mortazavi, B., A. Ortmann, L. Wang, R. Bernard, C. Staudhammer, D. J. Dalrymple, **R.H. Carmichael**, A. Kleinhuizen. Evaluating the impact of oyster (*Crassostrea virginica*) gardening on sediment nitrogen cycling in a subtropical estuary. *Bull. Mar. Sci.* 91:323-341.
- 2015 Dalrymple, J. D. and **R.H. Carmichael***. Effects of age class on N removal capacity of oysters and implications for bioremediation. *Mar. Ecol. Progr. Ser.* 528:205-220. (G)
- 2015 Venn-Watson, S., K. Colegrove, J. Litz, M. Kinsel, K. Terio, J. Saliki, S. Fire, **R.H. Carmichael**, C. Chevis, W. Hatchett, J. Pitchford, M. Tumlin, C. Field, S. Smith, R. Ewing, D. Fauquier, G. Lovewell, H. Whitehead, D. Rotstein, W. McFee, E. Fougères, T. Rowles. Adrenal gland and lung lesions in Gulf of Mexico common bottlenose dolphins (*Tursiops truncatus*) found dead following the Deepwater Horizon Oil Spill. *PLoS ONE*. 10(5): e0126538.
- 2015 Venn-Watson, S., L. Garrison, J. Litz, E. Fougères, B. Mase, G. Rappucci, E. Stratton, **R.H. Carmichael**, D. Odell, D. Shannon, S. Shippee, S. Smith, L. Staggs, M. Tumlin, H. Whitehead, T. Rowles. Demographic clusters identified within the northern Gulf of Mexico common bottlenose dolphin (*Tursiops truncatus*) unusual mortality event: January 2010- June 2013. *PLoS ONE*. 10(2): e0117248.
- 2015 D'Ambra, I., W. M. Graham, **R.H. Carmichael**, F. J. Hernandez, Jr. Fish rely on scyphozoan hosts as a primary food source: evidence from stable isotope analysis. *Mar. Biol.* 162:247-252. Feature Article, Highlighted in Harrod 2015 *Mar. Biol.* Editorial 162:245-246. (G)
- 2015 Aven, A., **R.H. Carmichael**, M. Ajemian, S. Powers. Addition of passive acoustic telemetry mitigates lost data from satellite-tracked manatees. *Mar. Freshwater Res.* 66:371-374. (G)
- 2014 Kellogg, M. L., A. Smyth, M. Luckenbach, **R.H. Carmichael**, B. Brown, J. Cornwell, M. Piehler, M. S. Owens, D. J. Dalrymple, C. Higgins. Use of oysters to mitigate eutrophication in coastal waters. *Est Coast Shelf Sci.* 151:156-168.

- 2014 Litz, J., M. Baran, S. R. Bowens-Stevens, **R.H. Carmichael**, K. Colegrove, L. Garrison, S. Fire, E. Fougeres, R. Hardy, S. Holmes, W. Jones, B. Mase-Guthrie, D. Odell, P. Rosel, J. Saliki, D. Shannon, S. Shippee, S. Smith, E. Stratton, M. Tumlin, H. Whitehead, G. Worthy, T. Rowles. Review of historical unusual mortality events in the Gulf of Mexico (1990-2009): providing context for the complex and long-lasting Northern Gulf of Mexico Cetacean UME. *Dis. Aquat. Org.* 112:161-175.
- 2014 Patterson H. K., A. Boettcher, **R.H. Carmichael**. Biomarkers of dissolved oxygen stress in oysters: A tool for restoration and management efforts. *PLoS ONE* 9(8):e104440. doi:10.1371/journal.pone.0104440. (G)
- 2014 Martin, J., H. Edwards, F. Bled, C. Fonnesebeck, J. Dupuis, B. Gardner, S. Koslovsky, A. Aven, L. Ward-Geiger, **R.H. Carmichael**, D. Fagan, M. Ross, and J. Royle. Estimating upper bounds for occupancy and number of manatees in areas potentially affected by oil from the Deepwater Horizon oil spill. *PLoS One* 9(3): e91683. doi:10.1371/journal.pone.0091683.
- 2014 D'Ambra, I., **R.H. Carmichael**, W.M. Graham. Determination of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ and trophic fractionation in jellyfish: implications for food web ecology. *Mar. Biol.* 161:473-480. (G)
- 2013 D'Ambra, I., W.M. Graham, **R.H. Carmichael**, A. Malej, V. Onofri. Predation patterns and prey quality of medusae in a semi-enclosed marine lake: implications for food web energy transfer in coastal marine ecosystems. *J. Plankton Res.* 35:1305-1312. doi: 10.1093/plankt/fbt065. (G)
- 2012 **Carmichael, R.H.*** A. Jones, H. Patterson, W. Walton, A. Pérez-Huerta, E. Overton, M. Dailey, K. Willett. Assimilation of oil-derived elements by oysters due to the Deepwater Horizon oil spill. *Environ. Sci. Technol.* 46:12787-12795. doi: 10.1021/es302369h
Featured by Gulf of Mexico Research Initiative <http://gulfresearchinitiative.org/studies-indicate-that-oyster-tissue-and-shell-were-similar-in-pre-and-post-oil-spill-conditions/> ^
- 2012 Prado, P., **R.H. Carmichael**, S. Watts, J. Cebrian, and K. Heck, Jr. Diet-dependent $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ fractionation among sea urchin *Lytechinus variegatus* tissues: Implications for food web models. *Mar. Ecol. Prog. Ser.* 462:175-190. (P)
- 2012 **Carmichael, R.H.***, W. Graham, A. Aven, G. Worthy, S. Howden. Were multiple stressors a 'perfect storm' for northern Gulf of Mexico bottlenose dolphins (*Tursiops truncatus*) in 2011? *PloS ONE* 7(7): e41155. doi:10.1371/journal.pone.0041155.
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- 2012 **Carmichael, R.H.***, W. Walton, H. Clark. Bivalve enhanced N removal from coastal estuaries. *Can. J. Fish. Aquat. Sci.* 69:1131-1149.
- 2012 **Carmichael, R.H.***, A. Shriver, and I. Valiela. Bivalve response to estuarine eutrophication: The balance between enhanced food supply and habitat alternations. *J. Shellfish Res.* 31: 1-11.
- 2012 **Carmichael, R. H.*** and E. Brush. Three decades of horseshoe crab rearing: A review of conditions for captive growth and survival. *Rev. Aquac.* 4: 32-43.
- 2012 Biancani, P., **R.H. Carmichael***, J. Daskin, W. Burkhardt III, K. R. Calci. Seasonal and spatial effects of wastewater effluent on growth, survival, and accumulation of microbial contaminants by oysters in Mobile Bay, Alabama. *Est Coasts.* 35:121-131. CESN highlight article. (G^)

- 2012 Drymon, J.M., S.P. Powers, **R.H. Carmichael**. Trophic plasticity in the Atlantic sharpnose shark (*Rhizoprionodon terraenovae*) from the north central Gulf of Mexico. *Environ. Biol. Fish.* 95:21-35.
- 2010 Graham, W., R. Condon, **R.H. Carmichael**, I. D'Ambra, H.K. Patterson, L. Linn, F. J. Hernandez, Jr. Oil carbon entered the coastal planktonic food web during the *Deepwater Horizon* oil spill. *Environ. Res. Lett.* 5(045301):1-6. 2010 Highlight.
- 2010 Kovacs, C., J. Daskin, H. Patterson, **R.H. Carmichael***. *Crassostrea virginica* shells record local variation in wastewater inputs to a coastal estuary. *Aquatic Biol.* 9:77-84. (U[^])
- 2009 Pabody, C., **R.H. Carmichael***, L. Rice, M. Ross. A new sighting network adds to 20 years of historical data on fringe West Indian manatee (*Trichechus manatus*) populations in Alabama waters. *Gulf Mexico Sci.* 27:52-61. (T)
- 2009 **Carmichael, R.H.***, E. Gaines, Z. Sheller, A. Tong, A. Clapp, I. Valiela. Diet composition of juvenile horseshoe crabs: Implications for growth and survival of natural and cultured stocks, p. 521-534. In J. Tanacredi, M. Botton, D. Smith [eds.], *Biology and Conservation of Horseshoe Crabs*. Springer, New York.
- 2009 Smith, D., M. Millard, **R.H. Carmichael**. Comparative status and assessment of *Limulus polyphemus* along the western Atlantic. p. 361-386. In J. Tanacredi, M. Botton, D. Smith [eds.], *Biology and Conservation of Horseshoe Crabs*. Springer, New York.
- 2008 **Carmichael, R.H.***, T. Hattenrath, I. Valiela, R. H. Michener. Nitrogen stable isotopes in the shell of *Mercenaria mercenaria* trace wastewater inputs from watersheds to estuarine ecosystems. *Aquatic Biol.* 4:99-111. Feature Article. (^)
- 2008 Daskin, J. H., K. Calci, W. Burkhardt, III, **R.H. Carmichael***. Use of N stable isotope and microbial analyses to define wastewater influence in Mobile Bay, AL. *Mar. Pollut. Bull.* 56:860-868. (U[^])
- 2007 Bowen, J., K. Kroeger, G. Tomasky, W. J. Pabich, , M. L. Cole, **R.H. Carmichael**, I. Valiela. A review of land-sea coupling by groundwater discharge of nitrogen to New England estuaries: Mechanisms and effects. *Applied Geochemistry.* 22:175-191.
- 2005 **Carmichael, R.H.*** and I. Valiela. Coupling of near-bottom seston and surface sediment composition: Changes with nutrient enrichment and implications for estuarine food supply and biogeochemical processing. *Limnol. Oceanogr.* 50:97-105.
- 2004 **Carmichael, R.H.***, A. Shriver, I. Valiela. Changes in shell and soft tissue growth, tissue composition, and survival of quahogs, *Mercenaria mercenaria*, and softshell clams, *Mya arenaria*, in response to eutrophic-driven changes in food supply and habitat. *J. Exp. Mar. Biol. Ecol.* 313:75-104.
- 2004 Rutecki, D., **R.H. Carmichael**, I. Valiela. Magnitude of harvest of Atlantic horseshoe crabs, *Limulus polyphemus*, in Pleasant Bay, Massachusetts. *Estuaries* 27:179-187. (G)
- 2004 **Carmichael, R.H.***, B. Annett, I. Valiela. Nitrogen loading to Pleasant Bay, Cape Cod: Application of models and stable isotopes to detect incipient nutrient enrichment of estuaries. *Mar. Pollut. Bull.* 48:137-143.
- 2004 **Carmichael, R.H.*** Effects of eutrophication on *Mya arenaria* and *Mercenaria mercenaria*: Growth, survival, and physiological responses to changes in food supply and habitat across estuaries receiving different nitrogen loads. Ph.D. Thesis, Boston University.

- 2004 **Carmichael, R.H.***, D. Rutecki, B. Annett, E. Gaines, I. Valiela. Position of horseshoe crabs in estuarine food webs: N and C stable isotopic study of foraging ranges and diet composition. *J. Exp. Mar. Biol. Ecol.* 299:231-253. (^)
- 2003 **Carmichael, R.H.***, D. Rutecki, I. Valiela. Abundance and population structure of the Atlantic horseshoe crab *Limulus polyphemus* in Pleasant Bay, Cape Cod. *Mar. Ecol. Prog. Ser.* 246:225-239.
- 2003 O'Connell, C.W., S.P. Grady, A.S. Leschen, **R.H. Carmichael**, I. Valiela. Stable isotopic assessment of site loyalty and relationships between size and trophic position of the Atlantic horseshoe crab, *Limulus polyphemus*, within Cape Cod estuaries. *Biol. Bull.* 205:254-255. (^)
- 2002 Weiss, E., **R.H. Carmichael**, I. Valiela. The effect of nitrogen loading on the growth rates of quahogs and softshell clams through changes in food supply. *Aquaculture* 211:275-289.
- 2002 Shriver, A. C., **R.H. Carmichael**, I. Valiela. Growth, condition, reproductive potential, and mortality of bay scallops, *Argopecten irradians*, in response to eutrophic-driven changes in food resources. *J. Exp. Mar. Biol. Ecol.* 279:21-40.
- 2002 Gaines, E., **R.H. Carmichael***, S. P. Grady, I. Valiela. Stable isotopic evidence for changing nutritional sources of juvenile horseshoe crabs. *Biol. Bull.* 203:228-230. (U^)
- 2002 Suggs, D., **R.H. Carmichael**, S. P. Grady, I. Valiela. Effects of individual size on pairing in horseshoe crabs. *Biol. Bull.* 203:225-227. (U^)
- 2001 Grady, S., D. Rutecki, **R.H. Carmichael**, I. Valiela. Age structure of the Pleasant Bay population of *Crepidula fornicata*: A possible tool for estimating horseshoe crab age. *Biol. Bull.* 201:296-297. (U^)
- 2001 Fila, L., **R.H. Carmichael**, A. Shriver, I. Valiela. Stable N isotopic signatures in bay scallop tissue, feces, and pseudofeces in Cape Cod estuaries subject to different N loads. *Biol. Bull.* 201:294-296. (U^)
- 1996 **Herrold R.E.**, A. Marchini, S. Fruehling, R. Longnecker. Glycoprotein 110, the Epstein-Barr virus homolog of herpes simplex virus glycoprotein B, is essential for Epstein-Barr virus replication in vivo. *J Virol.* 70:2049-2054.
- 1996 Fruehling S., S. K. Lee, **R.E. Herrold**, B. Frech, G. Laux, E. Kremmer, F. A. Grasser, R. Longnecker. Identification of latent membrane protein 2A (LMP2A) domains essential for the LMP2A dominant-negative effect on B-lymphocyte surface immunoglobulin signal transduction. *J Virol.* 70:6216-6226.

*Carmichael is corresponding author. *This information is provided as an additional indicator of Carmichael's contribution to manuscripts and mentorship because significance of author order can vary with field, student participation, collaborator preference, and journal standards.* P, T, G, U = Post-doc, technician, graduate student, or undergraduate student as first author working under Carmichael. ^REU student co-author.

Pre-prints

- 2016 Aven, A., **R.H. Carmichael**, E. Hieb, M. Ross. West Indian manatee movements reveal novel occupancy and distribution patterns in the northern Gulf of Mexico. *PeerJ Preprints* 4: e2072v1. (G)

Popular journals, comments, and technical reports:

- 2008-2022 Manatee Necropsy Reports, DISL's Manatees Sighting Network submitted to Florida Fish & Wildlife Conservation Commission and USFWS. MMSN122808-01 to present; various authors including M. Russell, A. Deming, E. Hieb, N. Wingers, C. Miller, C. Pabody, N. Taylor, **R.H. Carmichael**.
- 2017 **Carmichael, R.H.**, Hieb, E. Manatee Biological Assessment. Alabama Department of Transportation I-10 Mobile River Bridge and Bayway Widening. Prepared for Alabama Department of Transportation c/o Thompson Engineering. Mobile, AL.
- 2015 Dillon, K. J. Caffrey, **R.H. Carmichael**, K. Cressman, M. Woodrey. Water quality in Bangs Lake: effects of recurrent phosphate spills to a coastal estuary. Final Technical Report submitted to Mississippi Water Resources Research Institute, Mississippi State University
- 2015 **Carmichael, R.H.** and E. Hieb. Alabama manatees: The state's marine mammal makes a big splash. *Outdoor Alabama*. July 2015:16-19.
- 2013 Slone, D., J. Reid, A. Aven, **R.H. Carmichael**. Manatee movements in the northern Gulf of Mexico and potential for exposure to the Deepwater Horizon Oil Spill, US Geological Survey Tech. Rept.
- 2011 Garrison, L., J. Litz, **R.H. Carmichael**, T. Rowles, T. Collier, M. Tumlin, H. Finley, K. Walsh, R. P. Bourgeois, J. Adriance, P. Lang, D. Machnes. Nearshore cetacean & sea turtle prey item sampling plan. Prepared for the Marine Mammals and Sea Turtles Working Group of the Mississippi Canyon 252 Trustees
- 2011 Ross, M., **R.H. Carmichael**, A. Aven, J. Powell, N. Adimey. 2011. Manatee Aerial Surveys in Mississippi, Alabama and Louisiana under the Natural Resource Damage Assessment Program (NRDA): Results of the proposed data collection plan to assess injury to West Indian manatees outside of Florida from the Deepwater Horizon Oil Spill.
- 2010 **Carmichael, R.H.*** and C. Kovacs. Comment on Watanabe et al. 2009. *Mar. Pollut. Bull.* 60:314-315.

Newsletters, protocols, and permit applications:

- 2022 Hieb, E., J. Bloodgood, M. Russell, **R.H. Carmichael**, Dauphin Island Sea Lab Marine Mammal Research Program. IBC protocol, Approved by the University of South Alabama
- 2014-2022 IACUC protocols, Approved by University of South Alabama
- Bottlenose dolphin abundance and condition in nearshore and coastal systems
 - Capture, tagging, and tracking of West Indian manatees in Alabama waters
 - Collection of fish species in the Mobile Bay/Mississippi Sound system
- 2009-2022 Newsletter of the Mobile Manatees Sighting Network, 1-14 (1, 2)
- 2011-2022 **Carmichael, R.H.**, E. Hieb, J. Delo, A. Aven, C. Miller, N. Taylor. Save the Manatee Club Newsletter, Updates on Alabama Manatees (quarterly articles)
- 2021 Hieb, E., **R.H. Carmichael**, Keep an eye out for manatees this 4th of July weekend. *DISL News*.
- 2021 Bloodgood, J., Hieb, E., Russell, M., **R.H. Carmichael**, Mobile Bay stranded sperm whale post-mortem exam findings. *DISL News*.
- 2020 Felsher, J., Hieb, E., **R.H. Carmichael**, Sea monsters in Alabama? *Call News - Citronelle*, 10 June

- 2020 Rood, K., A. Teague, S. Barton, A. Alvarez-Aleman, E. Hieb. First documented round-trip movement between Cuba and the continental United States by a Florida Manatee, *Sirenews*. 71:29-32 (T)
- 2019 **Carmichael, R.H.**, A. Levins. Applications being accepted for 2020 NSF-REU program at DISL, *DISL Skimmer*. August/September
- 2019 Russell, M., **R.H. Carmichael**. ALMMSN trains volunteers to help respond, *DISL Skimmer*. August/September
- 2019 Thomason, T., **R.H. Carmichael**, E. Heib. DISL's Our Wastewater Footprint: Water Quality Lessons from Local Estuaries. *CERF's Up Magazine*. August
- 2019 Thomason, T., **R.H. Carmichael**, E. Heib. Our Wastewater Footprint. *Dog River Clearwater Revival Newsletter*. July
- 2019 Cloyd, C., E. Hieb, **R.H. Carmichael**. Risky business: New data show how manatees use shipping channels, *DISL Skimmer*. June/July
- 2019 Gancel, H., **R.H. Carmichael**. Playing 'tag': Tracking movement of young oysters, *DISL Skimmer*. June/July
- 2019 **Carmichael, R.H.**, A. Levins. The Sea Lab welcomes NSF REU students to campus for 2019 summer, *DISL Skimmer*. May
- 2019 Hieb, E., **R.H. Carmichael**. Community running club supports Alabama Marine Mammal Stranding Network, *DISL Skimmer*. April
- 2019 Thomason, T., **R.H. Carmichael**. DISL's Our Wastewater Footprint: Water quality lessons from local estuaries, *DISL Skimmer*. April
- 2019 Thomason, T., **R.H. Carmichael**, E. Heib. DISL's Our Wastewater Footprint: Water Quality Lessons from Local Estuaries *DISL Skimmer*. March
- 2019 Thomason, T., **R.H. Carmichael**, E. Heib. Our Wastewater Footprint. *ACF newsletter*. March
- 2019 Russell, M., **R.H. Carmichael**. Volunteers learn how to respond to stranded mammals, *DISL Skimmer*. January

Metadata & datasets:

- 2020 **Carmichael, R.H.**, Hieb, E. *The West Indian manatee population in Mobile Bay, AL and surrounding waters (1912-2019)*.
http://cf.disl.org/datamanagement/metadata_folder/DISL-Carmichael-MSN-010-2016.xml
- 2019 **Carmichael, R.H.**, E. Hieb, D. Hill. Fowl River, Alabama Marsh Restoration Study: Stable isotope and anthropogenic influences component (NCEI Accession 0195411: <https://doi.org/10.25921/878s-qy21>).
- 2018 **Carmichael, R.H.**, A. Frith. Water quality and nutrients data collected in West Fowl River and Coastal Alabama from 2017-07-31 to 2018-05-17 (NCEI Accession 0175941; <https://doi.org/10.25921/cvzv-mb75>).
- 2017 **Carmichael, R.H.**, Aven, A. *GPS Tracking of West Indian Manatees (Trichechus manatus latirostris) Tagged in Mobile Bay, Alabama (2009-2015)*.
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- 2017 **Carmichael, R.H.**, Hieb, E. *Water Quality at Six Sites in Alabama Waters Representing West Indian Manatee Habitat (2008-2016)*.

- http://cf.disl.org/datamanagement/metadata_folder/DISL-Carmichael-MSN-011-2017.xml
- 2016 **Carmichael, R.H.**, Estes, M. *American Horseshoe Crab Abundance in the Northern Central Gulf of Mexico in 2012-2013*.
http://cf.disl.org/datamanagement/metadata_folder/DISL-Carmichael-Estes-001-2016.xml
- 2016 **Carmichael, R.H.**, Wingers, N. *Strandings of Marine Mammals in Alabama 1978-2016*.
http://cf.disl.org/datamanagement/metadata_folder/DISL-Carmichael-ALMMSN-002-2016.xml
- 2015 **Carmichael, R.H.**, Patterson, H. *Growth Rate and Heat Shock Protein Data from Oysters Under Low Dissolved Oxygen Stress (2010)*. http://cf.disl.org/datamanagement/metadata_folder/DISL-Carmichael-Patterson-002-2015.xml
- 2012 **Carmichael, R.H.**, et al. *Assimilation of Oil-Derived Elements by Oysters Due to the Deepwater Horizon Oil Spill in 2010*.
http://cf.disl.org/datamanagement/metadata_folder/72.html
- 2011 **Carmichael, R.H.**, Biancani, P. *Seasonal and Spatial Effects of Wastewater Effluent on Oyster Ecology and Sanitation in Mobile Bay, Alabama*.
http://cf.disl.org/datamanagement/metadata_folder/30.html
- 2008 **Carmichael, R.H.** *Use of N stable isotope and microbial analyses to define wastewater influence in Mobile Bay, AL (2007)*.
http://cf.disl.org/datamanagement/metadata_folder/28.html

SELECTED RESEARCH GRANTS AND CONTRACTS

- 2022-2025 US EPA, Healthy and Resilient Gulf of Mexico 2020 RFA, Advanced microbial source tracking for community health in Alabama (Kiel-Reese PI \$498,144; Carmichael portion of award \$185,683). Collaborators: University of South Alabama (B. Kiel-Reese, S. Ní Chadhain)
- 2021-2024 Alabama Center of Excellence, Monitoring and predicting responses of a sentinel marine megafauna to climate change and implications for the tropicalization of the northern Gulf of Mexico (Carmichael PI: \$496,987). Collaborators: DISL/ USA (C. Cloyed, B. Dzwonkowski), University of Southern Mississippi (N. Phillips), Clearwater Marine Aquarium Research Inst. (M. Ross, J. Powell).
- 2021-2024 Alabama Center of Excellence, Assessing the function and vulnerability of forested wetlands in the Mobile-Tensaw-Apalachee River Delta (Anderson PI: \$459,481; Carmichael portion of award \$195,427). Collaborators: Auburn University (C. Anderson, L. Kalin)
- 2021-2022 Prescott Marine Mammal Rescue Assistance Grant Program, Maintaining and enhancing stranding response for manatees in the northern Gulf of Mexico (Carmichael PI; \$44,881) Collaborators: USFWS (T. Calleson)
- 2020-2024 Alabama Restoration Plan II: Enhancing capacity for the Alabama marine mammal stranding network restoration project (Carmichael PI; \$2,432,389) Collaborators: Alabama Department of Conservation and Natural Resources (ADCNR, A. Hunter, K. Swindle)
- 2020-2023 Gulf of Mexico Energy Security Act (GOMESA), Dauphin Island Sea Lab's Manatee Sighting Network & Research Program (Renewal, Carmichael PI; \$120,000) Collaborators: ADCNR (C. Blankenship)

- 2020-2022 Prescott Marine Mammal Rescue Assistance Grant Program, Transport capacity for stranded manatees in the northern Gulf of Mexico (Carmichael PI; \$68,097; NCE)
- 2020-2021 Alabama Division of Wildlife and Freshwater Fisheries, State Wildlife Grants, Estimating abundance & distribution of manatees (Cloyed PI \$27,112; Carmichael no-cost Co-PI/ mentor) Collaborators: ADCNR, SWG
- 2019-2023 Alabama Restoration Plan II: Assessment of Alabama estuarine bottlenose dolphin populations and health (Carmichael PI; \$3,059,229) Collaborators: Alabama Department of Conservation and Natural Resources (ADCNR, A. Hunter, K. Swindle), NOAA NMFS (K. Mullin)
- 2019-2020 Alabama Division of Wildlife and Freshwater Fisheries, Part II: Aerial surveys of manatee abundance and distribution in Alabama waters (Carmichael PI; \$17,907) Collaborators: ADCNR, Sea to Shore Alliance (M. Ross, J. Powell)
- 2018-2021 GoMRI VI, Consortium for Advanced Research on Marine Mammal Health Assessment (CARMMA) (L. Schwacke PI; \$4,736,265; Carmichael portion of award \$203,464) Collaborators: National Marine Mammal Foundation (L. Schwacke, C. Smith, B. Balmer, S. Venn-Watson), University of St. Andrews (L. Thomas), University of Connecticut (S. DeGuise), NOAA NMFS (T. Rowles), Chicago Zoological Society/ Sarasota Dolphin Research Program (R. Wells), University of Illinois (K. Colegrove); NCE 1 year
- 2018-2020 USA's Center for Environmental Resiliency, Mitigating Wastewater Contamination to Mississippi Sound: A novel partnership for management and education in Marine Science and Chemistry (A. Stenson PI; \$20,000; Carmichael portion of award \$5,000); NCE 1 year
- 2018-2019 Alabama Division of Wildlife and Freshwater Fisheries, Aerial surveys of manatee abundance and distribution in Alabama waters (Carmichael PI; \$26,326) Collaborators: ADCNR, Sea to Shore Alliance (M. Ross, J. Powell)
- 2017-2021 NOAA RESTORE Act Science program, Use of elemental signatures to detect and trace contaminant entry to the northern Gulf of Mexico coastal food web: managing multiple stressors (Carmichael PI; \$231,671) Collaborators: The Nature Conservancy, Alabama Department of Environmental Management (ADEM), ADCNR, NOAA Mussel Watch program; NCE 1 year
- 2017-2021 National Fish and Wildlife Foundation (NFWF), Alabama Marine Mammal Conservation and Recovery Program, Extension (Carmichael PI; \$621,089) Collaborators: NOAA NMFS, ADCNR, USFWS; NCE 1 year
- 2017-2020 Gulf of Mexico Energy Security Act (GOMESA), Dauphin Island Sea Lab's Manatee Sighting Network & Research Program (Carmichael PI; \$120,000) Collaborators: ADCNR (C. Blankenship)
- 2015-2020 National Fish and Wildlife Foundation (NFWF), Alabama Marine Mammal Conservation and Recovery Program (Carmichael PI; \$1,281,600) Collaborators: NOAA National Marine Fisheries Service, Southeast Region Stranding Network, ADCNR, USFWS (D. Ingram), Marine Mammal Commission, The Ocean Conservancy

OTHER GRANTS AND CONTRACTS

- 2022-2025 National Science Foundation, Research Experiences for Undergraduates Program, (Carmichael PI; \$316,262) Collaborators: DISL faculty, MESC schools
- 2021-2026 US Food and Drug Administration, DISL/FDA joint graduate fellowship program (Carmichael PI; \$150,000 renewable per year; \$750,000 total) Collaborators: USFDA and DISL faculty.
- 2021-2022 US Food and Drug Administration, DISL/FDA joint graduate fellowship program supplement (Carmichael Co-PI; \$1,000,000).
- 2019-2021 National Science Foundation, Research Experiences for Undergraduates Program, Supplement for meetings and publications (Carmichael PI; \$23,012)
- 2018-2021 National Science Foundation, Research Experiences for Undergraduates Program, (Carmichael PI; \$316,889) Collaborators: DISL faculty, MESC schools
- 2016-2021 US Food and Drug Administration, DISL/FDA joint graduate fellowship program (Carmichael PI; \$150,000 renewable per year; \$750,000 total) Collaborators: USFDA and DISL faculty.

AFFILIATIONS

American Association for the Advancement of Sciences (AAAS-International)
Association for the Sciences of Limnology and Oceanography (ASLO-International)
Coastal and Estuarine Research Federation (CERF-International)
Gulf Estuarine Research Society (GERS-Regional)
National Shellfisheries Association (NSA-National)
New England Estuarine Research Society (NEERS-Regional)
Society of Environmental Toxicology and Chemistry (SETAC-International)
The Society for Marine Mammalogy (SMM-International)

SELECTED MEETINGS AND PRESENTATIONS**Invited oral presentations at conferences & meetings:**

- 2018 National Conference on Ecosystem Restoration (NCER), New Orleans, LA “Use of ecological expertise for communicating sound management advice” (Panelist)
- 2018 Gulf and South Atlantic States Shellfish Conference, Mobile, AL “Shellfish, nutrients, and pathogens”
- 2017 Society for Marine Mammalogy’s Southeast Student Chapter, 2nd Annual Student Research Symposium, University of Southern Mississippi, Hattiesburg, MS “Science, communication and the marine mammal challenge”

Submitted oral presentations at conferences & meetings:

- 2021 Association for the Sciences of Limnology and Oceanography, Aquatic Sciences Meeting, virtual, “Testing stable isotope ratios and indices of n-alkane composition in oyster shell as tracers of anthropogenic pollution”
- 2020 Bays & Bayous Symposium, virtual, “Testing oyster shell as a proxy for tissue to detect trace metal pollution”
- 2018 Gulf Estuarine Research Society (GERS) Biennial Meeting, Galveston, TX, “Sources of water quality indicators to shellfish growing areas in the northcentral Gulf of Mexico”
- 2018 Bays & Bayous Symposium, Mobile, AL, “Our Wastewater Footprint: An example of adaptive research and user-driven product development”

- 2017 Coastal and Estuarine Research Federation (CERF) Biennial Conference, Providence, RI “Anthropro-proxy data in bivalves from middens to modern embayments and tropical to temperate systems”
- 2017 Goldschmidt 2017, Paris, France “Anthropro-proxy data in bivalves from middens to modern embayments and tropical to temperate systems”
- 2017 Alabama Academy of Sciences, 94th Annual Meeting, Mobile, AL “Sedimentary records of recurrent phosphate spills to a coastal estuary”

Poster presentations (first author):

- 2021 Coastal and Estuarine Research Federation (CERF) Biennial Conference (virtual) “Oyster shell may record human pollution”
- 2021 Ocean Sciences, Spain (virtual) “Testing stable isotope ratios and n-alkane composition in oyster shell as tracers of anthropogenic pollution”
- 2019 World Marine Mammal Conference (WMMC), Barcelona, Spain “Human influence on common bottlenose dolphin (*Tursiops truncatus*) strandings in the northern Gulf of Mexico”
- 2019 Coastal and Estuarine Research Federation (CERF) Biennial Conference, Mobile, AL “Sedimentary records of recurrent phosphate spills to a coastal estuary”
- 2019 4th International Workshop on the Science and Conservation of Horseshoe Crabs, Guangxi, China. “Horseshoe crab population response to natural and anthropogenic perturbations through time: hurricane, oil spill, and a decade of change”

Co-authored presentations at meetings or seminars:

- 2022 Graduate Student Research Symposium, Ocean Springs, MS “A novel technique for sampling the bottlenose dolphin skin microbiome” (Hansen, J., J. Bloodgood, B. Kiel-Reese, K. Subramaniam, T. Waltzek, K. Barry, T. Bouveroux, C. Sinclair, R.H. Carmichael; poster).
- 2021 Coastal and Estuarine Research Federation (CERF) Biennial Conference, virtual (2)
- “Strandings and skin lesions of bottlenose dolphins exposed to prolonged freshwater in Mobile Bay, AL. 2021 (Díaz Clark, C., M. Russell, J. Bloodgood, A. Deming, R.H. Carmichael; anchor oral)
 - “Site fidelity of bottlenose dolphins in Alabama waters using elemental analyses” (L. Clance, C. Cloyed, T. Bouveroux, C. Sinclair, K. Barry, K. Mullin, R.H. Carmichael; oral)
- 2021 Society of Environmental Toxicology and Chemistry (SETAC), virtual “Experimental determination of the isotopic fractionation of cadmium in Eastern oyster shells” (J. Pavelites, R.H. Carmichael, X. Wang, A. Beebe)
- 2021 Gulf of Mexico Graduate Student Seminar Series, virtual (2)
- “Spatial variation in size of stranded bottlenose dolphins (*Tursiops truncatus*) in the northern Gulf of Mexico” (Hodanbosi, M., R.H. Carmichael; oral)
 - “Characterizing site fidelity of bottlenose dolphins using elemental analyses and photo-identification” (Clance, L., T. Bouveroux, C. Cloyed, R.H. Carmichael; oral)
Awarded Best MS Student Oral Presentation
- 2021 Wildlife Disease Association, virtual “Skin lesion prevalence and demographic trends of stranded bottlenose dolphins following a freshwater event” (Bloodgood, J., M. Russell, C. Clark, A. Deming, R.H. Carmichael; oral)
- 2021 DISL Student Seminar Series, Dauphin Island, AL “Characterizing site fidelity of bottlenose dolphins using elemental analyses and photo-identification” (Clance, L., T. Bouveroux, C. Cloyed, R.H. Carmichael; oral)

- 2021 The Wildlife Society-Alabama Chapter, Auburn, AL, virtual “Habitat selection and abundance of West Indian manatees (*Trichechus manatus*) at the periphery of their ranges” (Cloyed, C., E. Hieb, K. DaCosta, M. Ross, R.H. Carmichael; oral)
- 2021 International Association of Aquatic Animal Medicine, virtual “Collaboration leads to successful monitoring, sedation and euthanasia, transport, and necropsy of a live stranded sperm whale (*Physeter macrocephalus*) in Mobile Bay, Alabama” (Bloodgood, J., M. Russell, D. Moore, T. Madrigal, C. Clark, E. Hieb, R.H. Carmichael.)
- 2020 Dauphin Island Sea Lab Seminar Series, Dauphin Island, AL “DISL’s Manatee Sighting Network: Understanding Gulf of Mexico manatees” (Hieb, E., R.H. Carmichael, C. Cloyed, K. DaCosta; oral).
- 2020 Bays & Bayous Symposium, virtual (6)
- “Cause of death and prevalence of *Brucella* spp. and morbillivirus spp. in bottlenose dolphins (*Tursiops truncatus*) in Alabama, 2015 – 2020” (Bloodgood J., A. Deming, K. Colegrove, M. Russell, C. Clark, R.H. Carmichael; oral)
 - “Specialization of a mobile, apex predator affects trophic coupling among adjacent habitats” (Cloyed, C.S., R. Wilson, B. Balmer, A. Hohn, L. Schwacke, E. Zolman, M. Tumlin, R. Wells, A. Barleycorn, J. Allen, R.H. Carmichael; oral)
 - “Sex identification of stranded bottlenose dolphins (*Tursiops truncatus*) improves with necropsy” (Russell, M., J. Bloodgood, E. Hieb, R.H. Carmichael; lightening talk)
 - “Stranding trends and skin lesion categorization of bottlenose dolphins (*Tursiops truncatus*) exposed to a freshwater input event in Mobile Bay, AL (Díaz Clark, C., M. Russell, J. Bloodgood, A. Deming, R.H. Carmichael; oral)
 - “Spatial variation in size of stranded common bottlenose dolphins in the northern Gulf of Mexico” (Hodanbosi, M., R.H. Carmichael; oral).
 - “Impacts of in-water construction on West Indian manatees in the northern Gulf of Mexico” (Hieb, E.E., R.H. Carmichael; oral)
- 2020 Gulf Estuarine Research Society (GERS), virtual “Spatial Variation in Size of Stranded Common Bottlenose Dolphins (*Tursiops truncatus*)” (Hodanbosi, M., R. Carmichael; oral)
- 2020 Dauphin Island Sea Lab/US Food & Drug Administration Annual Symposium/ thesis defense, Dauphin Island, AL “Environmental Effects on Histamine Production in Decomposing Fish” (Frith, A., K. Björnsdóttir-Butler, K. Calci, R.H. Carmichael; oral)
- 2020 Gulf of Mexico Oil Spill and Ecosystem Science (GOMOSSES), Tampa, FL (2)
- “Spatial, temporal, and individual-level variation in northern Gulf of Mexico common bottlenose dolphin diet” (Cloyed, C., B. Balmer, M. Tumlin, E. Zolman, A. Barleycorn, T. Rowles, L. Schwacke, R. Carmichael; poster)
 - “Oil-derived trace metal signature in *Crassostrea virginica* shell may provide historical record of oil exposure” (Peter, K., K. DaCosta, R.H. Carmichael; oral)
- 2019 North American Workshop on Laser Ablation, Austin, TX “Using trace element ratios to track lifetime freshwater exposure in bottlenose dolphins (*Tursiops truncatus*)” (Hodanbosi, M., K.P. DaCosta, R.H. Carmichael; poster)
- 2019 9th International Sirenian Symposium, Barcelona, Spain (2)
- “Linking use of ship channels by West Indian manatees to seasonal migration and habitat use” (E. Hieb, C. Cloyed, M. Collins, K. DaCosta, R.H. Carmichael; speed talk)
 - “A history of causes, patterns, and case studies of manatee mortality in the northern

- Gulf of Mexico” (E. Hieb, K. DaCosta, R.H. Carmichael; poster)
- 2019 Alabama Coastal Foundation, Sustainability Summit, Mobile, AL “Our Wastewater Footprint” (Thomason, T., E. Hieb, E. Darrow, R.H. Carmichael)
- 2019 World Marine Mammal Conference (WMMC), Barcelona, Spain (7)
- “X Marks the spot: Suspected broadhead arrow injuries in two bottlenose dolphins (*Tursiops truncatus*) along the Alabama Coast” (M. Collins, R.H. Carmichael, D.S. Rotstein, J.H. Byrd, and A.C. Deming; speed talk)
 - “Spatial, temporal, and individual-level variation in northern Gulf of Mexico common bottlenose dolphin diet” (C. Cloyed, R.H. Carmichael; poster)
 - “Linking use of ship channels by West Indian manatees to seasonal migration and habitat use” (E. Hieb, C. Cloyed, M. Collins, K. DaCosta, R.H. Carmichael; speed talk)
 - ‘Ontogenetic changes in trace element ratios track lifetime freshwater exposure in bottlenose dolphins (*Tursiops truncatus*)’ (M. Hodanbosi, R.H. Carmichael; poster)
 - “Analysis of manatee ear bone chemistry as a tool to track West Indian manatee migrations in the northern Gulf of Mexico” (K. DaCosta, R.H. Carmichael; poster)
 - “Four decades of stranding response: Hotspots, coverage gaps, and shifting baselines in North central Gulf of Mexico” (M. Russell, N. Wingers, A. Deming, R.H. Carmichael; poster)
 - “Perinate bottlenose dolphin mortality following the Northern Gulf of Mexico Unusual Mortality Event” (A. Deming, R.H. Carmichael; speed talk)
- 2019 Coastal and Estuarine Research Federation (CERF) Biennial Conference, Mobile, AL (14)
- “X Marks the spot: Suspected broadhead arrow injuries in two bottlenose dolphins (*Tursiops truncatus*) along the Alabama Coast” (M. Collins, R.H. Carmichael, D.S. Rotstein, J.H. Byrd, and A.C. Deming; poster)
 - “Detecting oil exposure using trace metal signatures in Eastern Oyster (*Crassostrea virginica*) shells” (K. Peter, R.H. Carmichael; oral)
 - “Spatial, temporal, and individual-level variation in northern Gulf of Mexico common bottlenose dolphin diet” (C. Cloyed, R.H. Carmichael; oral)
 - “Use of geochemical tagging to test Eastern oyster (*Crassostrea virginica*) population connectivity” (H. Gancel, R.H. Carmichael; oral)
 - “Linking use of ship channels by West Indian manatees to seasonal migration and habitat use” (E. Hieb, C. Cloyed, M. Collins, K. DaCosta, R.H. Carmichael; oral)
 - ‘Ontogenetic changes in trace element ratios track lifetime freshwater exposure in bottlenose dolphins (*Tursiops truncatus*)’ (M. Hodanbosi, R.H. Carmichael; poster)
 - “Analysis of manatee ear bone chemistry as a tool to track West Indian manatee migrations in the northern Gulf of Mexico” (K. DaCosta, R.H. Carmichael; oral)
 - “Combining trace elements and stable isotopes to detect human wastewater” (A. Knight, R.H. Carmichael; oral)
 - “Our Wastewater Footprint: Enhancing water quality through scientific communication and public outreach” (T. Thomason, E. Hieb, E. Darrow, R.H. Carmichael; oral)
 - “Four decades of stranding response: Hotspots, coverage gaps, and shifting baselines in North central Gulf of Mexico” (M. Russell, N. Wingers, A. Deming, R.H. Carmichael; oral)

- “Perinate bottlenose dolphin mortality following the Northern Gulf of Mexico Unusual Mortality Event” (A. Deming, R.H. Carmichael; oral)
 - “Time and temperature effects on histamine and histamine-producing bacteria (HPB) in decomposing fish” (A. Frith, K. Butler, R.H. Carmichael; oral)
 - “Dead or Alive: Elemental Analysis of Stranded Bottlenose Dolphins (*Tursiops truncatus*)” (R. Murray, R.H. Carmichael, A. Deming; poster)
 - “Comparison of left and right ear bone chemistry in West Indian manatees” (A. Mason, K. DaCosta, R.H. Carmichael; poster)
- 2019 National Estuarine Research Reserve (NERR) Annual Meeting, Charleston, SC “Our Wastewater Footprint: A living resource for science transfer”, (Thomason, T., E. Heib, R. Carmichael, K. Cressman; poster)
- 2019 Dauphin Island Sea Lab/US Food & Drug Administration Annual Symposium, Dauphin Island, AL (2)
- “Effects of time & temperature on histamine & histamine-producing bacteria (HPB) in decomposing Spanish mackerel” (Frith, A., K. Björnsdóttir-Butler, R.H. Carmichael; oral)
 - “Straight to the source: understanding wastewater inputs in a freshwater-dominated system” (Gancel, H.N., R.H. Carmichael, W. Burkhardt III, K. Calci; oral)
- 2019 Dauphin Island Sea Lab REU Symposium, Dauphin Island, AL (2)
- “Dead or Alive: Elemental Analysis of Stranded Bottlenose Dolphins (*Tursiops truncatus*)” (R. Murray, R.H. Carmichael, A. Deming; poster)
 - “Prevalence of *Brucella* in bottlenose dolphins (*Tursiops truncatus*) in Alabama from 2015-2019” (McMahon, V., M. Collins, M. Russell, R.H. Carmichael, A. Deming; poster)
- 2019 National Estuarine Research Reserve System (NERRS/NERRA) Annual meeting, Charleston, SC “Our wastewater footprint: A living resource for science transfer” (T. Thomason, E. Hieb, R.H. Carmichael; poster)
- 2019 4th International Workshop on the Science and Conservation of Horseshoe Crabs, Guangxi, China (2)
- “Using community-based conservation programs to protect horseshoe crabs and their habitat: best practices and applications to underserved regions” (Hieb, E., G. Gauvry, R.H. Carmichael; oral)
 - “Airsoft science: A test of horseshoe crab molt durability” (Carmichael, T.O., R.H. Carmichael; poster) Awarded Best Student Presentation
- 2019 Sustainability Summit, Alabama Coastal Foundation, Mobile, AL “Our Wastewater Footprint” (Thomason, T., E. Heib, E. Darrow, R.H. Carmichael; oral)
- 2019 Gulf of Mexico Oil Spill and Ecosystem Science (GOMOSES), New Orleans, LA (2)
- “The effect of the Deepwater Horizon Oil Spill on bottlenose dolphin diets” (Cloyed, C., M. Tumlin, M. Broadwater, L. Schwacke, B. Balmer, E. Zolman, T. Rowles, C. Smith, R. Carmichael; poster)
 - “Use of trace metals in oyster shell to detect oil contamination in the marine environment” (Peter, K., K. Dacosta, R.H. Carmichael; poster)
- 2019 International Association of Aquatic Animal Medicine (IAAAM), Durban, South Africa “Case Report: Freshwater exposure, successful relocation and subsequent drowning of

- subadult Atlantic bottlenose dolphin (*Tursiops truncatus*). (Deming, A., N. Wingers, D. Moore, D. Rotstein, R. Wells, R. Ewing, M. Hodanbosi, R.H. Carmichael; poster)
- 2019 University of South Alabama, Spring Research Forum, Mobile, AL (2)
- “Drivers of histamine-producing bacteria (HPB) in water samples & decomposing Spanish mackerel” (Frith, A., K. Björnsdóttir-Butler, R.H. Carmichael; poster and oral)
 - “Use of trace metals in oyster shell to detect oil contamination in the marine environment” (Peter, K., K. DaCosta, R.H. Carmichael; poster)
- 2019 DISL Student Seminar Series, Dauphin Island, AL (2)
- “Eastern oysters (*Crassostrea virginica*) as retrospective bioindicators of oil contamination” (K. Peter; oral)
 - Demographics of stranded bottlenose dolphins (*Tursiops truncatus*) along the Alabama coast” (Hodanbosi, M., R.H. Carmichael; oral)
- 2019 Department of Marine Resources, Dauphin Island, AL “Oyster (*Crassostrea virginica*) larval settlement, distribution, and connectivity in Mobile Bay and Mississippi Sound” (Gancel, H.N., R.H. Carmichael; oral)
- 2019 University of West Florida Seminar Series, Pensacola, FL “Oyster (*Crassostrea virginica*) larval settlement and distribution in a freshwater dominated and human influences estuary” (Gancel, H.N., R.H. Carmichael; oral)
- 2019 Dauphin Island Sea Lab 3-minute thesis, Dauphin Island, AL “Eastern oysters (*Crassostrea virginica*) as retrospective bioindicators of oil contamination” (Peter, K., R.H. Carmichael; oral).
- 2019 Alabama Water Resources Conference, Orange Beach, AL (3)
- “*Crassostrea virginica* forgo assimilation of freely dissolved oil indicator elements” (Peter, K., R.H. Carmichael; poster)
 - “An interdisciplinary collaboration leads to an assessment of marsh health in Fowl River, Alabama” (Webb, B., A. Beebe, R.H. Carmichael, J. Cebrian, J. Coogan, M. Cook, B. Dzwonkowski, J. Goff, E. Hieb, H. Horne, J. Kudulis, J. Lehrter, S. Smallegan, T. Thibaut; oral)
- 2019 Florida SeaGrant Seminar Series, Pensacola, FL “Perinate bottlenose dolphin mortalities following the Deepwater Horizon oil spill” (Deming, A., R.H. Carmichael; oral)
- 2018 Bays and Bayous Symposium, Mobile, AL (10)
- “Eastern oyster (*Crassostrea virginica*) settlement and population connectivity in a freshwater dominated estuary” (Gancel, H.N., R.H. Carmichael; oral)
 - “X marks the spot: Case studies of stranded bottlenose dolphins (*Tursiops truncatus*) in the northern Gulf of Mexico” (Collins, M.K., A.C. Deming, M.R. Hondanbosi, R.H. Carmichael; oral)
 - “Florida manatee (*Trichechus manatus latirostris*) diet in the northcentral Gulf of Mexico” (DaCosta, K.P., R.H. Carmichael; oral)
 - “The effects of lipid extraction on liver, muscle, and skin.” (Cloyed, C.S., K. DaCosta, M. Hodanbosi, R.H. Carmichael; oral)
 - “Environmental drivers of histamine-producing bacteria in water samples and decomposing Spanish mackerel tissues.” (Frith, A., K. Björnsdóttir-Butler, R.H. Carmichael; oral)

- “Eastern oysters (*Crassostrea virginica*) as retrospective bioindicators to detect oil contamination in the marine environment” (Peter, K., R.H. Carmichael; poster) Awarded 1st place Student Poster Presentation
 - “Influence of freshwater influx on the diet and body condition of the common bottlenose dolphin, *Tursiops truncatus*, in Mobile Bay, Alabama” (Hondanbosi, M.H., R.H. Carmichael; oral)
 - “A history of causes, patterns, and case studies of manatee mortality in the northern Gulf of Mexico” (Hieb, E.E., K.P. Dacosta, R.H. Carmichael; poster)
 - “Freshwater exposure, successful relocation, and subsequent drowning of a subadult Atlantic bottlenose dolphin (*Tursiops truncatus*)” (Deming, A.C., N.L. Wingers, D.P. Moore, R. Ewing, D. Rotstein, R.H. Carmichael; poster)
 - “Cetacean stranding demographics in Alabama from 1978 to 2017: Coverage gaps, stranding hotspots, and future directions” (Russell, M., N. Wingers, M. Hondanbosi, N. Santini, R.H. Carmichael; poster)
- 2018 Gulf Estuarine Research Society Biennial Meeting, Galveston, TX (6)
- “Eastern oyster (*Crassostrea virginica*) settlement and population connectivity in a freshwater dominated estuary” (Gancel, H.N., R.H. Carmichael; oral) Awarded 1st place Student Oral Presentation
 - “Florida manatee (*Trichechus manatus latirostris*) diet in the northcentral Gulf of Mexico” (DaCosta, K.P., R.H. Carmichael; oral)
 - “The effects of lipid extraction on liver, muscle, and skin.” (Cloyed, C.S., K. DaCosta, M. Hodanbosi, R.H. Carmichael; oral)
 - “Influence of freshwater influx on the diet and body condition of the common bottlenose dolphin (*Tursiops truncatus*) in Mobile Bay, Alabama” (Hondanbosi, M., R. H. Carmichael; oral)
 - “Environmental drivers of histamine-producing bacteria in water samples and decomposing Spanish mackerel tissues.” (Frith, A., K. Björnsdóttir-Butler, R.H. Carmichael; poster)
 - “Eastern oysters (*Crassostrea virginica*) as retrospective bioindicators to detect oil contamination in the marine environment” (Peter, K., R.H. Carmichael; poster)
- 2018 Southeastern Association of Fish and Wildlife Agencies, Mobile, AL. “Using telemetry to track manatee habitat use in the northern Gulf of Mexico” (DaCosta, K.P., R.H. Carmichael; oral)
- 2018 Alabama Water Resources Conference, Orange Beach, AL (3)
- “Sources of water quality indicators to a shellfish growing area in Portersville Bay, AL.” (Frith, A., R.H. Carmichael, K. Calci; oral).
 - “Tracking wastewater influence in a freshwater dominated urbanized estuary” (Gancel, H.N., R.H. Carmichael, W. Burkhardt III, K. Calci; oral) Awarded 1st place Student Oral Presentation
 - “Using NASA Earth observations to monitor salinity changes in the Mobile Bay/Mississippi Sound system and application to manatee movement” (Estes, M., M. Bartkovich, L. Parker, P. Lemieux, R.H. Carmichael; poster)
- 2018 Dauphin Island Sea Lab/US Food & Drug Administration Annual Symposium, Dauphin Island, AL (2)
- “Environmental drivers of histamine-producing bacteria in water samples and decomposing Spanish mackerel tissues.” (Frith, A., K. Björnsdóttir-Butler, R.H. Carmichael; oral)

- “Riverine influence on wastewater indicators in Mobile Bay and Mississippi Sound” (Gancel, H.N., R.H. Carmichael, W. Burkhardt III, K. Calci; oral)
- 2018 Gulf of Mexico Coastal Ocean Observing System (GCOOS) Animal Telemetry Network (ATN) Workshop, New Orleans, LA. “Tracking manatee habitat use in the northern Gulf of Mexico” (DaCosta, K.P., R.H. Carmichael; oral)
- 2018 University of South Alabama Graduate Research Forum, Mobile, AL (4)
- “Sources of bacterial water quality indicators to shellfish growing areas in the northcentral Gulf of Mexico” (Frith, A., K. Calci, R.H. Carmichael; poster)
 - “Analysis of manatee periotic bone chemistry as a tool to track West Indian manatee migrations in the northcentral Gulf of Mexico” (DaCosta, K., R.H. Carmichael; poster)
 - “Bivalve shells as a method of determining anthropogenic sources to estuarine systems” (Knight, A., J. Kinsella, R.H. Carmichael; poster)
 - “Use of elemental signatures in eastern oyster (*Crassostrea virginica*) shells to assess population connectivity” (Nicholson, H.S., R.H. Carmichael, K. Park).
- 2018 Gulf of Mexico Graduate Student Symposium, Dauphin Island, AL (5)
- “Understanding the mechanism of histamine fish poisoning: Variables affecting histamine-producing bacteria” (Frith, A., K. Björnsdóttir-Butler, R.H. Carmichael; oral) Awarded Honorable Mention student presentation
 - “Use of calcein to understand oyster (*Crassostrea virginica*) larval movements in a freshwater dominated estuary” (Nicholson H., R.H. Carmichael; oral) Awarded Honorable Mention student presentation
 - “Analysis of manatee periotic bone chemistry as a tool to track West Indian manatee migrations in the northcentral Gulf of Mexico” (DaCosta, K., R.H. Carmichael; poster)
 - “Bivalve shells as a method of determining anthropogenic sources to estuarine systems” (Knight, A., J. Kinsella, R.H. Carmichael; poster)
- 2018 Ocean Sciences Meeting, Portland, OR (2)
- “Using NASA Earth observations to monitor salinity changes in the Mobile Bay/ Mississippi Sound system and application to manatee movement” (Estes, M., M. Bartkovich, L. Parker, P. Lemieux, III., R.H. Carmichael; poster)
 - “Chilean mussels reconstruct environmental conditions during two coral die-off events” (H. Togami, A. Knight, R.H. Carmichael; poster)
- 2017 Coastal and Estuarine Research Federation (CERF) Biennial Conference, Providence, RI (4)
- “Applying community sanctuaries to conserve horseshoe crabs and their habitat in underserved regions.” (Hieb, E., G. Gauvry, R.H. Carmichael; oral)
 - “Defining horseshoe crab habitat with sparse data” (Estes, Jr. M., R.H. Carmichael, X. Chen; oral)
 - “Tracking wastewater influence on oysters (*Crassostrea virginica*) in freshwater dominated urbanized estuary” (Nicholson, H.S., R.H. Carmichael, W. Burkhardt, K. Calci; oral)
 - “Analysis of manatee ear bone chemistry to track West Indian manatee migrations in the northcentral Gulf of Mexico” (DaCosta, K.P., R.H. Carmichael; oral)
 - “Mercury bioaccumulation in estuarine food webs with different nitrogen loads” (Fleming, J., J. Logan, C. Lamborg, D. Taylor, R.H. Carmichael, J. Kinsella; poster)

- 2017 Society for Marine Mammalogy Biennial Conference on the Biology of Marine Mammals, Halifax, Nova Scotia (2)
- “Mapping thermal refugia in Alabama waters: Understanding West Indian manatee (*Trichechus manatus*) habitat use in the north central Gulf of Mexico.” (Hieb, E.E., A. Garelick, K. DaCosta, R.H. Carmichael; poster)
 - "Analysis of manatee ear bone chemistry to track West Indian manatee migrations in the northcentral Gulf of Mexico" (DaCosta, K.P., R.H. Carmichael; oral)
- 2017 Dauphin Island Sea Lab REU Symposium, Dauphin Island, AL “Chilean mussels reconstruct environmental conditions during two coral die-off events” (Togami, H., A. Knight, R.H. Carmichael; poster)
- 2017 Dauphin Island Sea Lab/Food & Drug Administration Annual Symposium, Dauphin Island, AL “Microbial concentrations relative to major water flow and oyster larval dispersal patterns in Mobile Bay and Mississippi Sound” (Nicholson, H.S., R.H. Carmichael, W. Burkhardt III, K. Calci; oral)
- 2017 31st Annual Water Resource Conference, Orange Beach, AL “Tracking wastewater influence on oysters (*Crassostrea virginica*) in freshwater dominated urbanized estuary” (Nicholson, H.S., R.H. Carmichael, W. Burkhardt, III, K. Calci; oral) Awarded 2nd place Student Oral Presentation
- 2017 University of South Alabama Spring Research Forum, Mobile AL (2)
- “Population connectivity and habitat use of the Florida manatee (*Trichechus manatees latirostris*) in the northcentral Gulf of Mexico” (DaCosta, K., R.H. Carmichael; oral- 3MT, Three Minute Thesis)
 - “Coincidental distribution of wastewater inputs and oyster (*Crassostrea virginica*) larvae in a freshwater dominated estuary” (Nicholson, H., R.H. Carmichael, K. Calci, W. Burkhardt, III; poster)
- 2017 Alabama Academy of Sciences, 94th Annual Meeting, Mobile, AL (2)
- “Analysis of manatee periodic bone microchemistry as a tool to track West Indian manatee migrations in the northcentral Gulf of Mexico” (DaCosta, K., K. Brill, R.H. Carmichael; oral)
 - “Citizen-science provides data on seasonal occupancy of West Indian manatees (*Trichechus manatus*) in the northcentral Gulf of Mexico” (Hieb, E., R.H. Carmichael, A. Aven, C. Nelson-Seely, N. Taylor; oral)

Guest lectures and seminars:

- 2022 University of West Florida, FL “Population ecology of West Indian manatees in the nGOM!”
- 2021, 2022 University of South Alabama, MAS 332 Marine Sciences II “Horseshoe crab ecology 101”
- 2021 DISL Research Experience for Undergraduates (REU) Program Recruitment Seminar, “DISL REU Program 2022” 4 public seminars via Zoom (Nov-Dec)
- 2021 Auburn University, AL “Use of elemental signatures to detect & trace contaminant entry to the nGOM coastal food web: managing multiple stressors”
- 2021 University of Alabama, Birmingham, virtual seminar “Use of elemental signatures to detect & trace contaminant entry to the nGOM coastal food web: managing multiple stressors”
- 2021 Alabama USFWS Seminar, virtual, “Manatee Research at DISL”
- 2020 USFWS Seminar, virtual, “Manatee Research at the Dauphin Island Sea Lab”
- 2020 Mississippi Aquarium, virtual, “Manatee Research at the Dauphin Island Sea Lab”

- 2020 DISL Research Experience for Undergraduates (REU) Program Recruitment Seminar, virtual, “DISL REU Program 2021”
- Judson College, Marion, AL (October)
 - Stillman College, Tuscaloosa, AL (October)
 - 4 additional public seminars via Zoom (Oct-Nov)
- 2020 Birmingham Southern University, Birmingham, AL “Protecting our Marine Mammals: Manatees, Dolphins, & Whales in the northern Gulf of Mexico” and “DISL REU Program 2020-2021”
- 2020 OneNOAA Science Seminars, RESTORE Program, virtual “Eastern Oysters (*Crassostrea Virginica*) as Retrospective Bioindicators of Trace Metal Contamination”
- 2019 DISL Research Experience for Undergraduates (REU) Program Recruitment Seminar, “DISL REU Program 2020”
- Alabama State University, Montgomery, AL (October)
 - Tuskegee College, Tuskegee, AL (October)
 - Judson College, Marion, AL (October)
 - Stillman College, Tuscaloosa, AL (October)
 - Jackson State University, Jackson, MS (October)
- 2019 Texas A&M University at Galveston, TX “Use of elemental ratios to define habitat and food resource use by marine mammals in the northern Gulf of Mexico.”
- 2019 Odyssey USA, University of South Alabama, Mobile, AL “Manatee research at the Dauphin Island Sea Lab”
- 2018-2019 University of South Alabama, Gulf Shores Campus, Distinguished Lecture Series, Gulf Shores, AL
- “Protecting our sea life from environmental stressors” (2018)
 - “Protecting our marine mammals: Manatees, dolphins & whales” (2019)
- 2018 DISL Research Experience for Undergraduates (REU) Program Recruitment Seminar, “DISL REU Program 2019”
- University of Mobile, Mobile, AL (October)
 - Alabama State University, Montgomery, AL (October)
 - Tuskegee College, Tuskegee, AL (October)
 - Judson College, Marion, AL (October)
 - Stillman College, Tuscaloosa, AL (October)

Invited oral presentations for outreach and education:

- 2022 GulfChat, Gulf Quest Maritime Museum, Mobile, AL “Manatees in Alabama waters” (<https://www.facebook.com/GulfQuestMaritimeMuseum/videos/660721331638597>)
- 2021 Pelican’s Nest Science Lab, Baldwin County, AL “Horseshoe crab ecology”
- 2020 Ten years of discovery: Celebrating the legacy of GoMRI in Alabama, Sea Grant Programs of the Gulf of Mexico “Building Capacity, Training the Next Generation” (Webinar: <https://gulfseagrant.org/oilspilloutreach/alabama-gomri-showcase/>)
- 2020 Sea Grant in the Gulf. Oysters Adapting to a Changing Gulf, Part III: Oysters and Oil Spills “Assimilation of oil-derived elements by oysters” (Webinar: <https://gulfseagrant.org/oilspilloutreach/presentations/oysters-adapting-to-a-changing-gulf/>)
- 2020 University Programs Summer Career Development Program, Dauphin Island, AL “Internships and Grad School” (panelist)

- 2019 Mobile Bay Green Drinks, Alabama Coastal Foundation, Alchemy Tavern, Mobile, AL
“Our Wastewater Footprint”
- 2019 Environmental town hall, AL House Democratic Caucus, Fairhope, AL “Issues
Impacting Mobile Bay” (panelist)
- 2018 NOAA Gulf of Mexico Regional Collaboration Team Webinar, Three-minute roundup
“Summary of ongoing NOAA collaborative research”

Television, radio, internet, magazine interviews & other publicity:

- 2008-present News articles featuring research and outreach activities
<http://www.disl.org/about/faculty/rcarmichael> (*In the News* link)
- 2022 Alabama Public Radio, Guy Busby, “Manatees appear to be trading Florida waters for
Alabama’s” (<https://www.apr.org>; 03 Feb) [Radio]
- 2020 FM 106.5 Talk Radio, Sean Sullivan, “Update on stranded sperm whale in Mobile Bay,
AL” (1 segment) [Radio]
- 2020 International Horseshoe Crab Day, videos
<https://youtu.be/rmlOAlodt54>
<https://youtu.be/YcIihiEKYr8>
- 2018 BREC Conservation, Nature Explorers Camp, Baton Rouge, LA. “Skype with a
Scientist” (Hieb, Russell, Collins, Deming; skype interview/ Q&A)
- 2018 State of the Bay, Mobile Bay Magazine, January issue (cover feature)
https://issuu.com/mobilebaymagazine/docs/january_2018_web
- 2017 Short film: Manatees in Alabama, Save the Manatee Club (youtube.com)
- 2017 Short film: Coastal Alabama Oceans, NASA DEVELOP National Program Summer
2017, (featuring interview with Hieb; youtube.com)

Workshops & Training sessions (designed and/or lead by Carmichael):

- 2022 DISL REU Mentor Training
- *Program Review & Evaluation*
 - *DEI & Mentoring Underrepresented Students* (with Emma Yackso, VA Center for
Inclusive Communities)
- 2021-2022 Ethics in Scientific Publishing, Research Integrity Workshop, University of South
Alabama Department of Marine Sciences, Dauphin Island Sea Lab, AL
- 2018 End-user product unveiling: Our Wastewater Footprint, NOAA NERRS National Science
Collaborative Stakeholder Workshop co-hosted with Grand Bay NERR, Moss Point, MS

Participant in Workshops, Working Groups, & Training Sessions:

- 2022 *Courageous Conversations*, University of South Alabama LGBTQ+ Ally Training
- 2021-2022 *Elements of an REU*, National Science Foundation, GEO REU workshop series
- 2021-2022 Research Integrity Workshop, University of South Alabama Department of Marine
Sciences, Dauphin Island Sea Lab, AL
- 2021 Perdido and Pensacola Bays Fish and Wildlife Workshop, virtual
- 2021 Mississippi Dolphin Research Workshop, Marine Mammal Commission
- 2021 Responsible Conduct of Research (RCR) Training Series, University of South Alabama
- Research Misconduct, Questionable Research Practices
 - Security and Science
 - Mentor-mentee relationships

- 2020 West Indian manatee Species Range Project (SRP). U.S. Fish and Wildlife Service.
- 2019 *It Starts with a Conversation: Faculty Diversity and Inclusion Training*, DISL/ University of South Alabama, Mobile, AL
- 2018 The Alliance of Marine Mammal Parks and Aquariums (AMMPA)/Dolphin Quest workshop, “Opportunities to Enhance Your Research by Working with Zoos and Aquariums”, Sarasota, FL
- 2018 Diversity and Inclusion training, University of South Alabama, Mobile, AL
- 2014, 2018 Safe Zone: LGBTQ Ally training (4 h), University of South Alabama, Mobile, AL
- 2016, 2018 NSF GEO, Research Experiences for Undergraduates Mentor Workshop, Boulder, CO

SELECTED SYNERGISTIC ACTIVITIES

- 2022-present Chair, Awards Committee, Coastal and Estuarine Research Federation
- 2019-present Member, Publications Committee, Coastal and Estuarine Research Federation
- 2015-present DISL Coordinator, DISL/ FDA joint graduate fellowship program
- 2014-present Director, DISL’s Research Experience for Undergraduates (REU) program
- 2014-present Chair and member, Tenure and Promotion Committees
- Dauphin Island Sea Lab (Department annually)
 - University of South Alabama (Department 2014-present; University 2020; College of Engineering 2022)
- 2013-present Member, Horseshoe crab Species Specialist Group, IUCN (International)
- 2012-present Editorial Boards
- *Frontiers in Marine Science*, Biology (Review Editor, 2022-present; International)
 - *Gulf & Caribbean Research* (Assoc. Editor, 2019-present; REU section Special Editor; Regional)
 - *Aquatic Biology* (Review Editor, 2012-present; International)
 - *Estuarine Coastal & Shelf Science* (Assoc. Editor, 2013-2018; International)
 - *PLoS ONE* (Academic Editor, 2013-2016; International)
 - *Coastal and Estuarine Science News* (CESN) (Board member, 2012-2015; International)
- 2010-present Member, Science Advisory Committee, Mobile Bay National Estuary Program (Co-Chair 2014-2018; regional)
- 2007-present Advisor, Ecological Research & Development Group, Lewes, DE (Regional)
- 2007-present Member, Data Management Advisory Committee, DISL; Chair, 2007-2012 (Departmental)
- 2011-2019 Governing Board, Coastal and Estuarine Research Federation (International)
- Chair, Attendee Experience Committee, Biennial Meeting, 2017-2019
 - Member-at-Large, 2015-2019
 - Chair, Publications Committee, 2015-2019
 - Affiliate Society Presidents subcommittee, 2014-2015
 - International Relations Committee, 2011-2013
 - Scientific Advisory Committee, CERF Argentina 2012