

RUTH HERROLD CARMICHAEL

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Associate Professor of Marine Sciences, University of South Alabama
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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
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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
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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 Estes, M., **R.H. Carmichael**, X. Chen. Environmental factors and the occurrence of horseshoe crabs in the northcentral Gulf of Mexico. *J. Wildlife Manage.* (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. *Mov. Ecol.* (G)
- Submitted Hieb, E., E. Eniang, L. Keith-Diagne, **R.H. Carmichael**. A Review of Impacts of In-Water Bridge Construction on Manatees. *Marine Mammal Sci.* (T)
- 2020 Cloyd, 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 A. Deming, 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)
- 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 Sciara, 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. R. 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. 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 truncates*) 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. Fougères, 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. Fonnesbeck, 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. L. 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.
- 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. Featured in Nature News <http://www.nature.com/news/perfect-storm-hit-gulf-of-mexico-dolphins-1.11011>

- 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. J., **R. H. Carmichael***, J. H. 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. H. Condon, **R. H. Carmichael**, I. D'Ambra, H. K. Patterson, L. J. 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.

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 (2016): e2072v1. (G)

Popular journals, comments, and technical reports:

2008-2020 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.

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:

2014-2020 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

2009-2020 Newsletter of the Mobile Manatees Sighting Network, 1-11 (1, 2)

- 2011-2020 **Carmichael, R. H.**, E. Hieb, J. Delo, A. Aven, C. Miller, N. Taylor. Save the Manatee Club Newsletter, Updates on Alabama Manatees (quarterly articles)
- 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 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 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

Metadata & datasets:

- 2019 **Carmichael, R. H.**, Hieb, E. *The West Indian manatee population in Mobile Bay, AL and surrounding waters (1912-2018)*. 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)*. http://cf.disl.org/datamanagement/metadata_folder/DISL-Carmichael-Aven-001-2017.xml
- 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

- 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)
- 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 (CARMMHA) (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
- 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

- 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.
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AFFILIATIONS

Alabama Fisheries Association (AFA-Regional)
American Association for the Advancement of Sciences (AAAS-International)
American Fisheries Society (AFS-National)
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”
- 2015 MS-AL Sea Grant Consortium, Oil spill Science Seminar: Healthy Gulf Seafood, Long Beach, MS “Effects of the Deepwater Horizon oil event on oysters in the northcentral Gulf”
- 2015 University of Southern Mississippi, Deepwater Horizon a Scientists Perspective Seminar Series, Long Beach, MS “Effects of oil contaminants on sentinel species in nGOM”

Submitted oral presentations at conferences & meetings:

- 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 “Anthropo-proxy data in bivalves from middens to modern embayments and tropical to temperate systems”
- 2017 Goldschmidt 2017, Paris, France “Anthropo-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”
- 2016 Bays & Bayous Symposium, Biloxi, MS (2)
- “Use of shipping channels and fairways by the West Indian Manatee (*Trichechus manatus*) in the Northcentral Gulf of Mexico”
 - “Freshwater exposure and human interaction: Case history of a twice-stranded bottlenose dolphin in Alabama waters” (N. Wingers, D. Moore, R. Ewing, R. Carmichael; oral, Carmichael gave presentation)
- 2015 Society for Marine Mammalogy Biennial Conference on the Biology of Marine Mammals, San Francisco, CA “Use of stable isotope ratios for life-time diet reconstruction in West Indian manatees”
- 2015 Coastal and Estuarine Research Federation (CERF) Biennial Conference, Portland, OR “Sedimentary records of recurrent phosphate spills to a coastal estuary”

Poster presentations (first author):

- 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”
- 2016 NSF REU Program PI Workshop, Boulder, CO “DISL REU program: Results of targeted recruitment for minority & underserved students”
- 2015 3rd International Workshop on Science and Conservation of Horseshoe Crabs, Sasebo City, Nagasaki, Japan “Structure of northern and southern populations of juvenile American horseshoe crabs inferred from molt size frequency analysis”
- 2015 Mississippi Water Resources Conference, Mississippi Water Resources Research Institute (MWRRI), Jackson, MS, “Planning the future with an eye to the past: Land use and water quality on the Mississippi-Alabama coast”

Co-authored presentations at meetings or seminars:

- 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 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

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”, (T. Thomason, 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 “Dead or Alive: Elemental Analysis of Stranded Bottlenose Dolphins (*Tursiops truncatus*)” (R. Murray, 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” (T. Thomason, E. Hieb, 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*). (A. Deming, 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., Beebe, A., Carmichael, R., Cebrian, J., Coogan, J., Cook, M., Dzwonkowski, B., Goff, J., Hieb, E., Horne, H., Kudulis, J., Lehrter, J., Smallegan, S., Thibaut, T.; 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 (5)

- “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)
- “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). Awarded 1st place Student Oral Presentation
- “Tracking wastewater influence in a freshwater dominated urbanized estuary” (Gancel, H.N., R.H. Carmichael, W. Burkhardt III, K. Calci; oral)
- “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)
 - “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)
- 2016 Bays & Bayous Symposium, Biloxi, MS (7)
- “Wastewater influence on oyster (*Crassostrea virginica*) larvae distribution in a freshwater and human influenced estuary” (Nicholson, H., R.H. Carmichael, W.

- Burkhardt III, K. Calci; oral) “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)
 - “Bivalve shells record anthropogenic effects on water quality in Guantanamo Bay, Cuba” (Knight, A., R.H. Carmichael; oral)
 - “Freshwater exposure and human interaction: Case history of a twice-stranded bottlenose dolphin in Alabama waters” (Wingers, N., D. Moore, R. Ewing, R.H. Carmichael; oral, Carmichael gave presentation)
 - “Aerial thermographic detection of manatee refugia in the northcentral Gulf of Mexico” (Garelick, A., K. DaCosta, R.H. Carmichael; poster)
 - “Water quality in Bangs Lake: effects of recurrent phosphate spills to a coastal estuary: Year 2” (Dillon, K., J. Caffrey, R.H. Carmichael, B. Dzwonkowski, S. Holcomb, T. Berry, G. Baine, J. Sleek, R. Capps, J.G. Hall, E. Hieb, P. Dimens, E. Condon, Y. Li, J. Millwood, K. Cressman, C. Newman, M. Woodrey, W. Underwood; oral)
- 2016 Gulf Estuarine Research Society (GERS) biennial meeting, Pensacola, FL (3)
- “Wastewater influence on oyster (*Crassostrea virginica*) larvae distribution in a freshwater and human influenced estuary” (Nicholson H., R.H. Carmichael, W. Burkhardt III, K. Calci; oral)
 - “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)
- 2016 University of South Alabama Spring Research Forum, Mobile, AL (4)
- “Analysis of manatee periodic bone microchemistry as a tool to track manatee migrations in the northern Gulf of Mexico” (DaCosta, K., R.H. Carmichael, W. Patterson; poster)
 - “Use of bivalve shell to trace anthropogenic pollution at Guantanamo Bay, Cuba” (Knight, A., R.H. Carmichael; poster)
 - “Photo-identification of West Indian manatee (*Trichechus manatus*) provides data on long distance migrations and repeated occurrence in the northern Gulf of Mexico” (Hieb, E., R.H. Carmichael, A. Aven; poster)
 - “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)
- 2016 Association for the Sciences of Limnology and Oceanography, Ocean Sciences Meeting, New Orleans, LA
- “Organic stable isotopes in ancient oyster shell trace pre-colonial nitrogen sources” (E.S. Darrow, R.H. Carmichael, C.F. Andrus, H.E. Jackson; poster)
 - “American horseshoe crab (*Limulus polyphemus*): Population ecology within the

- northern Gulf of Mexico (Carter, S., R.H. Carmichael, M. Estes, Jr., M. McBarnes; poster)
- 2016 Mississippi Water Resources Conference, Jackson, MS, “Water Quality in Bangs Lake: effects of recurrent phosphate spills to a coastal estuary: Year 2” (Dillon, K., J. Caffrey, R.H. Carmichael, B. Dzwonkowski, S. Holcomb, T. Berry, G. Baine, J. Sleek, R. Capps, J. Hall, E. Hieb, P. Dimens, E. Condon, Y. Li, J. Millwood, K. Cressman, C. Newman, M. Woodrey, W. Underwood; poster)
- 2016 NERRS/NERRA Annual Meeting, Williamsburg, VA "What happens when phosphate spills into an estuary?" (Cressman, K., J. Caffrey, R.H. Carmichael, K. Dillon, B. Dzwonkowski, C. Griffin, M. Posten, M. Woodrey; poster)
- 2016 Dauphin Island Sea Lab REU Symposium, Dauphin Island, AL
- “Aerial thermographic detection of manatee refugia in the northcentral Gulf of Mexico” (Garelick, A., K. DaCosta, R.H. Carmichael; poster)
 - “Use of shipping channels and fairways by the West Indian manatee (*Trichechus manatus*) in the northcentral Gulf of Mexico (Thompson, E., A.M. Aven, E.E. Hieb, R.H. Carmichael; poster)
- 2016 University of South Alabama Biology Student Association, Mobile, AL. “Dauphin Island Sea Lab’s Manatee Sighting Network” (Hieb, E., R.H. Carmichael, A. Aven, K. DaCosta; oral)
- 2015 Society for Marine Mammalogy Biennial Conference on the Biology of Marine Mammals, San Francisco, CA (5)
- “Distribution of stranded bottlenose dolphins (*Tursiops truncatus*) throughout Alabama waters from 2004-2013” (Wingers, N., C. Nelson-Seely, R. Carmichael; speed talk)
 - “Analysis of manatee periotic bone microchemistry as a tool to track manatee migrations in the northern Gulf of Mexico” (DaCosta, K., R.H. Carmichael, W. Patterson; oral)
 - “Sighting demographics of the West Indian manatee (*Trichechus manatus*) in Alabama and Mississippi waters” (Hieb, E. E., R. H. Carmichael, A. Aven, K. DaCosta, C. Nelson-Seely, J. Delo, N. Taylor; poster)
 - “Assigning stranded dolphins to stock using stable isotope ratios” (Hohn, A., L. Thomas, R. Carmichael, S. Holmes, J. Litz, D. Shannon, S. Shippee, C. Sinclair, S. Smith, T. Speakman, M. Tumlin, E. Zolman; oral)
 - “Long-term, consistent data sets aid in the investigation of bottlenose dolphin strandings in the northern Gulf of Mexico following the Deepwater Horizon oil spill” (Litz, J., K. Colegrove, S. Venn-Watson, R. Carmichael, E. Fougères, L. Noble, D. Shannon, S. Shippee, S. Smith, L. Staggs, S. Stevens, E. Stratton, M. Tumlin, T. Rowles; oral)
- 2015 Coastal and Estuarine Research Federation (CERF) Biennial Conference, Portland, OR (4)
- “Developing a sustainability model for the American Horseshoe Crab in the northcentral Gulf of Mexico” (Estes, M.G., Jr., X. Chen, R.H. Carmichael; poster)
 - “Finding your estuary’s roots: Investigating effects of land-use change with little historical context” (Darrow, E.S., R.H. Carmichael, K. Calci, W. Burkhardt, III; poster)

- “Oyster settlement patterns in the freshwater dominated estuaries of Mobile Bay and Eastern Mississippi Sound” (Nicholson, H., R.H. Carmichael, K. Park, M. Han; poster)
 - “Genetic diversity and population structure of West Indian manatees in the northcentral Gulf of Mexico” (DaCosta, K.P., M. Hunter, R.H. Carmichael, R. Bonde, E. E. Hieb; oral)
- 2015 Marine Megafauna Movement Workshop, King Abdullah University of Science and Technology (KAUST), Thuwal, Saudi Arabia, “West Indian manatee tracking reveals novel occupancy patterns in the Gulf of Mexico” (Aven, A., R.H. Carmichael; oral)
- 2015 3rd International Workshop on Science and Conservation of Horseshoe crabs, Sasebo City, Nagasaki, Japan
- “Analysis of the dynamics of the American horseshoe crab (*Limulus polyphemus*) in the North Central Gulf of Mexico for developing habitat suitability model” (Estes, M.G. Jr., X. Chen, R.H. Carmichael; poster)
 - “Examination of large exuviae with mating scars: Do adult female American horseshoe crabs, *Limulus polyphemus*, molt after sexual maturity?” (Hieb, E., R.H. Carmichael, G. Gauvry, C.N. Shuster, C. Jr.; oral) Deatured on NHK (Japan Broadcasting Corporation) television
- 2015 Gulf of Mexico Marine Mammal Research and Monitoring Meeting, New Orleans, LA
- “Sighting demographics of the West Indian manatee (*Trichechus manatus*) in Alabama and Mississippi waters” (Hieb, E., R.H. Carmichael, A. Aven, K. DaCosta, C. Nelson-Seely, J. Delo, N. Taylor; poster)
 - “Modeling West Indian manatee movements informs space use patterns and phenology in the northern GOM” (Aven, A., R.H. Carmichael; poster)
 - “Distribution of stranded bottlenose dolphins (*Tursiops truncatus*) in Alabama waters from 2004 – 2013” (Wingers, N., C. Nelson-Seely, R.H. Carmichael; poster)
- 2015 University of South Alabama Spring Research Forum, Mobile, AL (5)
- “Analysis of manatee periotic bone microchemistry as a tool to track manatee migrations in the northern Gulf of Mexico” (DaCosta, K.P., K. McLaughlin, W.F. Patterson, R.H. Carmichael, K. Brill; poster)
 - “Suitability of calcein for mass marking marine bivalve larvae (*Crassostrea virginica*) under different salinity and tank conditions” (Nicholson, H., R.H. Carmichael, S. Rikard; poster)
 - “Sighting demographics of the West Indian manatee (*Trichechus manatus*) in Alabama and Mississippi waters” (Hieb, E., R.H. Carmichael, A. Aven, K. DaCosta, C. Nelson-Seely, J. Delo, N. Taylor; poster)
 - “Distribution of stranded bottlenose dolphins (*Tursiops truncatus*) in Alabama waters from 2004 – 2013” (Wingers, N., C. Nelson-Seely, R.H. Carmichael; poster)
 - “Investigating potential domoic acid exposure in West Indian manatees stranded in coastal Alabama” (Frank, J., A. Robertson, R.H. Carmichael; poster)
- 2015 National Academy of Sciences (NAS) Gulf Research Program, Dauphin Island, AL, “Analysis of manatee periotic bone microchemistry as a tool to track manatee

- migrations in the northern Gulf of Mexico” (DaCosta, K.P., K. McLaughlin, W.F. Patterson, R.H. Carmichael, K. Brill; poster)
- 2015 Dauphin Island Sea Lab REU Symposium, Dauphin Island, AL “American horseshoe crab (*Limulus polyphemus*): Population ecology in the northern Gulf of Mexico” (Carter, S., R.H. Carmichael, M. Estes, M. McBarnes; poster)
- 2015 Gulf of Mexico Graduate Student Symposium, Dauphin Island, AL, “Analysis of manatee periotic bone microchemistry as a tool to track manatee migrations in the northern Gulf of Mexico” (DaCosta, K.P., K. McLaughlin, W.F. Patterson, R.H. Carmichael, K. Brill; poster)
- 2015 Association for the Sciences of Limnology and Oceanography (ASLO) Aquatic Sciences Meeting, Grenada, Spain, “Bringing together research and management to examining the consequences of repeated phosphorus spill in a coastal estuary” (Caffrey, J., M. Woodrey, K. Dillon, R. Carmichael, K. Cressman, E. Darrow; poster)
- 2015 International Association of Aquatic Animal Medicine (IAAAM) 46th Annual Conference, Chicago, IL, “The 2010-2015 northern Gulf of Mexico cetacean unusual mortality event: An update on diagnostic test results and pathologic findings (Colegrove, K., S. Venn-Watson, J. Litz, M. Kinsel, K Terio, J Saliki, S Fire, R Ewing, E Fougères, R Carmichael, et al.; poster)

Guest lectures and seminars:

- 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”
- 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)

- 2017 Red Knot Aquaculture Interactions Workshop, Tuckerton, NJ “Review of horseshoe crab ecology and the importance of habitat”
- 2017 Gulf Coast Research Laboratory, Ocean Springs, MS “Anthropo-proxy data in bivalves from middens to modern embayments and tropical to temperate systems”
- 2016 Red Knot Aquaculture Interactions Workshop, Wildwood Crest, NJ “Review of horseshoe crab ecology”
- 2016 DISL Research Experience for Undergraduates (REU) Program Recruitment Seminar, “DISL REU Program 2017”
- University of Mobile, Mobile, AL (October)
 - Alabama State University, Montgomery, AL (October)
 - Huntingdon College, Montgomery, AL (October)
 - University of West Alabama, Livingston, AL (October)
- 2016 Limuli Laboratories, Eldora, NJ “Contributions of Dr. Carl N. Shuster, Jr. to science education through the Green Eggs & Sand curriculum and workshops”
- 2015-2016 DISL Research Experience for Undergraduates (REU) Program lectures, Dauphin Island, AL
- “Orientation to DISL’s REU Summer Program”
 - “Scientific Presentations: Fundamentals of creating and delivering a successful oral and poster presentation”
 - “Scientific Writing: Data display, papers, thesis/dissertation, CVs”
- 2015 Environmental Protection Agency (EPA), Gulf Breeze, FL “Shallow water phantoms: Understanding northern Gulf of Mexico manatees”
- 2015 National Ocean Sciences Bowl (NOSB), Ocean Springs, MS, “Effects of ocean contaminants on sentinel species in the northern Gulf of Mexico”
- 2015 University of Alabama, Marine Sciences Club, Tuscaloosa, AL, “Dauphin Island Sea Lab summer programs & research opportunities”
- Invited oral presentations for outreach and education:**
- 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”
- 2017 Mobile Baykeeper, 20th Anniversary film screening, Gulf Coast Exploreum, Mobile, AL “The future of marine conservation”
- 2017 Mobile Rotary Club, Mobile, AL “DISL’s Manatee Sighting Network: Understanding Gulf of Mexico manatees”
- 2017 Gulf Coast Research Laboratory, Science Café, Ocean Springs, MS “Shallow water phantoms: Understanding northern Gulf of Mexico manatees”
- 2016 Magnolia Springs Community Association, Magnolia Springs, AL, “DISL’s Manatee Sighting Network: Understanding Alabama manatees & Magnolia Springs!”

- 2015 Mobile Bay Canoe and Kayak Club, Five Rivers Delta Resource Center, Spanish Fort, AL “Shallow water phantoms: Understanding northern Gulf of Mexico manatees”
- 2015 Crepe Myrtle Trail Ride, Mobile, AL “Mobile Bay: A natural coastal resource”
- 2015 Magnolia Springs Community Association, Magnolia Springs, AL “Shallow water phantoms: Understanding Alabama manatees & Magnolia Springs!”

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)
- 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)
- 2017 Tri Beta, University of North Alabama chapter, Florence, AL. “DISL’s Manatee Sighting Network: Understanding Gulf of Mexico manatees. (Hieb, E., R.H. Carmichael, A. Aven, K. DaCosta; webinar)
- 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)
- 2016 WNSP 105.5, Great Days Outdoors, (Featuring research and outreach, Hieb) [Radio]
- 2016 FM 106.5 Talk Radio, Sean Sullivan, “Update on manatees in Alabama” (2 segments) [Radio]
- 2016 WPML, Local 15 Today, “Record number of local manatee sightings,” Hieb [Television]
- 2015-2016 WPML, Local 15 Today, “Dauphin Island Sea Lab Discovery Day,” Hieb [Television]
- 2015 WHEP 1310, Live from Magnolia Springs Seafood Celebration, Hieb [Radio]
- 2015 WPML, Local 15 Today (Featuring research and outreach, Hieb/ DaCosta; multiple segments) [Television]

Workshops & training sessions (designed and lead by Carmichael):

- 2018 End-user product unveiling: Our Wastewater Footprint, NOAA NERRS National Science Collaborative Stakeholder Workshop co-hosted with Grand Bay NERR, Moss Point, MS
- 2016 Communicating Science, USFWS, Fiver Rivers Delta Center, Spanish Fort, AL
- 2014 Grand Bay: Planning the future with an eye on the past, NOAA NERRS National Science Collaborative Stakeholder Workshop co-hosted with Grand Bay NERR, Moss Point, MS

Participant in workshops, working groups, & training sessions:

- 2019 It starts with a conversation: Faculty Diversity and Inclusion Training, DISL/ University of South Alabama, Mobile, AL
- 2018 CARMMA dolphin health assessments, Grand Isle, LA and Dauphin Island, 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

2018 Safe Zone training (4 hour), University of South Alabama, Mobile, AL

2018 Expert elicitation, Oyster Expert Panel, Dauphin Island Sea Lab, AL

2016, 2018 NSF GEO, Research Experiences for Undergraduates Mentor Workshop, Boulder, CO

2016 Red Knot Aquaculture Interactions Workshop, Wildwood Crest, NJ

2016 Conceptual Ecosystem Modeling workshop, NOAA Restore, St. Petersburg, FL

2015 Gulf of Mexico Marine Mammal Research and Monitoring Meeting, New Orleans, LA

SELECTED SYNERGISTIC ACTIVITIES

2019-present Member, Publications Committee, Coastal and Estuarine Research Federation

2015-present DISL Coordinator, DISL/ FDA joint graduate fellowship program

2014-present Coordinator, DISL’s Research Experience for Undergraduates (REU) program

2014-present Chair, Tenure and Promotion Committees

- Dauphin Island Sea Lab (Department)
- University of South Alabama (Department 2014-present; University 2020)

2013-present Member, Horseshoe crab Species Specialist Group, IUCN (International)

2012-present Editorial Boards

- 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)

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)

- Member-at-Large, 2015-2019
- Chair, Publications Committee, 2015-2019
- Chair, Attendee Experience Committee, Biennial Meeting, 2017-2019
- Affiliate Society Presidents subcommittee, 2014-2015
- International Relations Committee, 2011-2013
- Scientific Advisory Committee, CERF Argentina 2012

2014-2018 Co-Chair, Science Advisory Committee, Mobile Bay National Estuary Program (Member 2010-present; regional)