

# Research Digest



Issue No. 2 (January - March 2022)

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## Message from the Associate Dean of Research and Advisory Services

The Office of Research & Advisory Services is pleased to provide the second installment of the VIMS Research Digest. As a multi-disciplinary research and education institution, VIMS is the technical advisor to the Commonwealth of Virginia and serves as the graduate school of marine science for William & Mary. VIMS faculty, staff, and students publish over 200 peer-reviewed scientific publications and technical reports, annually. This annotated bibliography provides a listing of the peer-reviewed publications by VIMS authors and co-authors for the first quarter of 2022 (January – March 2022).

Most of the publications listed in this issue are open access journals that you can access by clicking on the provided link. Feel free to distribute this to others that you think may be interested.

Mark W. Luckenbach, Associate Dean



Office of Research & Advisory Services  
Virginia Institute of Marine Science  
William & Mary

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Title Pathogenic *Vibrio parahaemolyticus* increase in intertidal-farmed oysters in the mid-Atlantic region, but only at low tide

Author(s) Ben-Horin, T., **Audemard, C.**, Calvo, L., **Reece, K.S.**, Bushek, D.

Link <https://doi.org/10.1002/naaq.10218>

Journal North American Journal of Aquaculture, 84 (1), pp. 95-104 (2022).

Summary We investigated whether intertidal-cultured oysters in the mid-Atlantic region are associated with elevated concentrations of the human-pathogenic *Vibrio parahaemolyticus* bacteria compared to subtidal oysters. Our results indicated that potential increases in concentrations in intertidal oysters are only observed at low tide, opposing regulations that would prohibit intertidal culture during summer.

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Title Aquaculture and eelgrass *Zostera marina* interactions in temperate ecosystems

Author(s) Howarth, L.M., Lewis-McCrea, L.M., **Kellogg, M.L.**, Apostolaki, E.T., Reid, G.K.

Link <https://doi.org/10.3354/AE100426>

Journal Aquaculture Environment Interactions, 14, pp. 15-34 (2022).

Summary This paper reviews the impacts of shellfish and finfish aquaculture on eelgrass *Zostera marina*, the most widely distributed seagrass species in the northern hemisphere. Numerous studies have examined the impacts of shellfish aquaculture on eelgrass and have found that it can have positive, neutral, and/or negative impacts. In contrast, only one field study has investigated the effects of finfish aquaculture on eelgrass in a temperate setting and the results were inconclusive. However, many studies have investigated the effects of Mediterranean finfish farms on 2 other species of seagrass (*Posidonia oceanica* and *Cymodocea nodosa*) and reported clear negative interactions. The paper concludes by highlighting key research gaps that could help regulators establish unambiguous operational and siting guidelines that minimize the potential for negative interactions between aquaculture and eelgrass.

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Title Genome-wide analysis of acute low salinity tolerance in the eastern oyster *Crassostrea virginica* and potential of genomic selection for trait improvement

Author(s) McCarty, A.J., **Allen, S.K., Jr**, Plough, L.V.

Link <https://doi.org/10.1093/G3JOURNAL/JKAB368>

Journal G3: Genes, Genomes, Genetics, 12 (1), art. no. jkab368 (2022).

Summary Chromosome markers were found in the genome of the eastern oyster (*C. virginica*) that indicate selection for low salinity will be successful. Low salinity tolerance would improve oyster aquaculture in estuarine areas where grow is slower due to freshwater influence.

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| Title     | Spatial patterns in aragonite saturation horizon over the northern California shelf   |
| Author(s) | Anderson, R.J., Hines, E., <b>Mazzini, P.L.F.</b> , Elliott, M., Largier, J.L., Jahncke, J.   |
| Link      | <a href="https://doi.org/10.1016/j.rsma.2022.102286">https://doi.org/10.1016/j.rsma.2022.102286</a>   |
| Journal   | Regional Studies in Marine Science, 52, art. no. 102286 (2022).   |
| Summary   | Ocean acidification can affect a number of marine calcifying organisms by promoting dissolution of their shells and skeletons, often made of calcite or aragonite. In this paper we demonstrated how a physical oceanographic process known as upwelling controls the spatial extent of low aragonite saturation state in coastal waters off California; as upwelling is expected to be enhanced with climate change, more shelf water habitat will become undersaturated in aragonite, negatively impacting populations of calcifying organisms. |

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| Title     | Drivers and seasonal variability of redox-sensitive metal chemistry in a shallow subterranean estuary   |
| Author(s) | * <b>O'Connor, A.E.</b> , <b>Canuel, E.A.</b> , Beck, A.J.  |
| Link      | <a href="https://doi.org/10.3389/fenvs.2021.613191">https://doi.org/10.3389/fenvs.2021.613191</a>   |
| Journal   | Frontiers in Environmental Science, 9, art. no. 613191 (2022).  |
| Summary   | This study measured the groundwater composition of a shallow subterranean estuary in Virginia (USA) over two years and used statistical analyses to characterize the influence of salinity and redox chemistry on the behavior of four redox-sensitive metals molybdenum, uranium, vanadium and chromium. |

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| Title     | Climate drives long-term change in Antarctic Silverfish along the western Antarctic Peninsula  |
| Author(s) | <b>*Corso, A.D., Steinberg, D.K.</b> , Stammerjohn, S.E., <b>Hilton, E.J.</b>  |
| Link      | <a href="https://doi.org/10.1038/s42003-022-03042-3">https://doi.org/10.1038/s42003-022-03042-3</a>  |
| Journal   | Communications Biology, 5 (1), art. no. 104 (2022).  |
| Summary   | Corso et al. employ a novel 25-year time series to show how variability in sea ice coverage and ocean temperatures impact larval abundance of an important forage fish, the Antarctic Silverfish. The authors provide insights into how current reductions of this keystone species might impact the vulnerable pelagic ecosystem along the western Antarctic Peninsula. |

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| Title     | Adaptive carbon export response to warming in the Sargasso Sea   |
| Author(s) | Lomas, M.W., Bates, N.R., Johnson, R.J., <b>Steinberg, D.K.</b> , Tanioka, T.  |
| Link      | <a href="https://doi.org/10.1038/s41467-022-28842-3">https://doi.org/10.1038/s41467-022-28842-3</a>  |
| Journal   | Nature Communications, 13 (1), art. no. 1211 (2022).   |
| Summary   | A long time series from the open ocean documents a biological response to ocean warming and nutrient reductions wherein particulate carbon export is maintained, rather than reduced as predicted. Carbon export is maintained through phytoplankton community change to favor species with high carbon-to-phosphorus ratios and enhanced shallow phosphorus recycling leading to increased nutrient use efficiency. |

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| Title     | A general pattern of trade-offs between ecosystem resistance and resilience to tropical cyclones   |
| Author(s) | <b>Patrick, C.J.</b> , Kominoski, J.S., McDowell, W.H., Branoff, B., Lagomasino, D., Leon, M., <b>Hensel, E., Hensel, M.J.S., Strickland, B.A.</b> , Aide, T.M., Armitage, A., Campos-Cerqueira, M., Congdon, V.M., Crowl, T.A., Devlin, D.J., Douglas, S., Erisman, B.E., Feagin, R.A., Geist, S.J., Hall, N.S., <b>Hardison, A.K.</b> , Heithaus, M.R., Hogan, J.A., Hogan, J.D., <b>*Kinard, S.</b> , Kiszka, J.J., Lin, T.-C., Lu, K., Madden, C.J., Montagna, P.A., O'Connell, C.S., Proffitt, C.E., Reese, B.K., Reustle, J.W., Robinson, K.L., Rush, S.A., Santos, R.O., Schnetzer, A., Smee, D.L., Smith, R.S., Starr, G., Stauffer, B.A., Walker, L.M., Weaver, C.A., Wetz, M.S., Whitman, E.R., Wilson, S.S., Xue, J., Zou, X.   |
| Link      | <a href="https://doi.org/10.1126/sciadv.abl9155">https://doi.org/10.1126/sciadv.abl9155</a>  |
| Journal   | Science Advances, 8 (9), (2022).   |
| Summary   | Hurricanes drive coastal ecosystem dynamics, and their frequency, intensity, and spatial distribution are predicted to shift with climate change. To advance our understanding of factors that influence coastal ecosystem response to hurricanes, we summarized metrics of ecosystem resistance and resilience for 4,138 ecosystem time series from n = 26 storms that occurred between 1985 and 2018. We observed a repeated pattern of trade-offs between resistance and resilience for populations, ecosystems, and ecosystem functions. These patterns are likely the outcomes of evolutionary adaptation, with species evolving to be better at resistance or resilience but not both. The results advance our fundamental understanding of disturbance ecology and provide important information for managers seeking to enhance coastal resistance and resilience. |

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| Title     | Ignition frequency and climate controlled Alaskan tundra fires during the Common Era  |
| Author(s) | <b>Vachula, R.S.</b> , Liang, J., Sae-Lim, J., Xie, H.  |
| Link      | <a href="https://doi.org/10.1016/j.quascirev.2022.107418">https://doi.org/10.1016/j.quascirev.2022.107418</a>   |
| Journal   | Quaternary Science Reviews, 280, art. no. 107418 (2022).  |
| Summary   | Recent fire events in Alaskan tundra ecosystems have been identified as harbingers of climate change. Although some work has demonstrated the novelty of these fires and linked weather, climate, and environmental variables to their occurrence, our understanding remains preliminary. We address this gap by comparing paleofire records with relevant climate, vegetation, and environmental datasets to identify the most important controls of tundra fire. We find that atmospheric CO <sub>2</sub> is the primary control of tundra fire, followed by summer temperature, and precipitation. |

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**Title** The biogeography of community assembly: Latitude and predation drive variation in community trait distribution in a guild of epifaunal crustaceans

**Author(s)** Gross, C.P., Emmett Duffy, J., Hovel, K.A., Kardish, M.R., Reynolds, P.L., Boström, C., Boyer, K.E., Cusson, M., Eklöf, J., Engelen, A.H., Eriksson, B.K., Joel Fodrie, F., Griffin, J.N., Hereu, C.M., Hori, M., Randall Hughes, A., Ivanov, M.V., Jorgensen, P., Kruschel, C., Lee, K.-S., Lefcheck, J., McGlathery, K., Moksnes, P.-O., Nakaoka, M., O Connor, M.I., O Connor, N.E., Olsen, J.L., **Orth, R.J.**, Peterson, B.J., Reiss, H., Rossi, F., Ruesink, J., Sotka, E.E., Thormar, J., Tomas, F., Unsworth, R., Voigt, E.P., Whalen, M.A., Ziegler, S.L., Stachowicz, J.J.

**Link** <https://doi.org/10.1098/rspb.2021.1762>

**Journal** Proceedings of the Royal Society B., 289 (1969), art. no. 20211762 (2022).

**Summary** By examining how species interactions and environmental filters influence community structure across biogeographic regions, we demonstrate how both latitudinal variation in species interactions and historical contingency shape these responses.

**Title** Investigating the epibiotic peritrich *Zoothamnium intermedium* Precht, 1935: Seasonality and distribution of its relationships with copepods in Chesapeake Bay (USA)

**Author(s)** \***Safi, L.S.L.**, Tang, K.W., **Carnegie, R.B.**

**Link** <https://doi.org/10.1016/j.ejop.2022.125880>

**Journal** European Journal of Protistology, 84, art. no. 125880 (2022).

**Summary** *Zoothamnium intermedium* is an obligate ciliate epibiont with conflicting distribution patterns reported. We examined life cycle, host preferences, and ecological conditions of *Z. intermedium* in Chesapeake Bay. Only copepods *Acartia tonsa* and *Centropages hamatus* were colonized, with higher colonization on *C. hamatus*, even when *A. tonsa* was more abundant. Analyses of prevalence in *A. tonsa* shows a strong correlation with dissolved oxygen, salinity, and water temperature.

**Title** Oyster shell production and loss in the Chesapeake Bay

**Author(s)** **Mann, R., Southworth, M.**, Wesson, J., **Thomas, J.**, Tarnowski, M., Homer, M.

**Link** <https://doi.org/10.2983/035.040.0302>

**Journal** Journal of Shellfish Research, 40 (3), pp. 451-469 (2021).

**Summary** Individual longevity in Chesapeake Bay oysters is < 5 y. Shell productivity is maximal in years 1 or 2. Mortality provides shell to maintain reef structure. Shell exhibits high turnover rates ( $\geq 30\%$  y<sup>-1</sup>). Reef accretion rates are generally less than the combination of sedimentation and relative sea level rise.

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| Title     | Reviews and syntheses: Spatial and temporal patterns in seagrass metabolic fluxes   |
| Author(s) | Ward, M., Kindinger, T.L., Hirsh, H.K., Hill, T.M., Jellison, B.M., Lummis, S., <b>Rivest, E.B.</b> , Waldbusser, G.G., Gaylord, B., Kroeker, K.J.  |
| Link      | <a href="https://doi.org/10.5194/bg-19-689-2022">https://doi.org/10.5194/bg-19-689-2022</a>   |
| Journal   | Biogeosciences, 19 (3), pp. 689-699 (2022).   |
| Summary   | <p>Seagrass meadow metabolism has been measured for decades to gain insight into ecosystem processes and, more recently, to inform its potential in ameliorating ocean acidification (OA), a process of changing water chemistry caused by global and local anthropogenic drivers. We synthesized the results from 56 studies and found that daytime seagrass meadow production is positive overall and similar across seasons and geographies. The potential cumulative effect of seagrass beds on seawater chemistry was also positive overall but was higher in summer months in both tropical and temperate ecosystems. Our results can serve as estimates of when and where OA amelioration by seagrasses may be likely.</p> |

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**Title** Tidal simulation revisited

**Author(s)** **Huang, W., Zhang, Y.J., Wang, Z., Ye, F.,** Moghimi, S., Myers, E., Yu, H.

**Link** <https://doi.org/10.1007/s10236-022-01498-9>

**Journal** Ocean Dynamics, 72, pp. 187–205 (2022).

**Summary** Accurate representation of tides is a pre-requisite for simulating many complex coastal processes. This study examines several most important factors for rigorous validation of nearshore tides. The results demonstrate that a rigorous model validation against tide gauge observation requires: (1) good-quality digital elevation model information be available; (2) locally very high mesh resolution be used to capture the small-scale bathymetric/geometric features near the tide gauges; and (3) 3D effects be included.

**Title** Marine heatwaves in the Chesapeake Bay

**Author(s)** **Mazzini, P.L.F., Pianca, C.**

**Link** <https://doi.org/10.3389/fmars.2021.750265>

**Journal** Frontiers in Marine Science, 8, art. no. 750265 (2022).

**Summary** Marine Heatwaves (MHWs) are prolonged events of anomalously warm sea water temperature, and little is known about their occurrence and characteristics in estuarine systems. We investigated MHWs in the Chesapeake Bay and found that because of long-term Bay warming, these events are occurring more frequently; our analysis also suggest that by the end of the century the Bay will reach a semi-permanent MHW state, when extreme temperatures will be present over half of the year, and thus could have devastating impacts to the bay ecosystem, exacerbating eutrophication, increasing the severity of hypoxic events, killing benthic communities, causing shifts in species composition and decline in important commercial fishery species.

**Title** Uncrewed ocean gliders and saildrones support hurricane forecasting and research

**Author(s)** Miles, T.N., Zhang, D., Foltz, G.R., Zhang, J.A., Meinig, C., Bringas, F., Triñanes, J., Le Hénaff, M., Vargas, M.F.A., Coakley, S., Edwards, C.R., **Gong, D.,** et al.

**Link** <https://doi.org/10.5670/oceanog.2021.supplement.02-28>

**Journal** Oceanography, 34 (4), pp. 78-81 (2021).

**Summary** Autonomous underwater gliders and uncrewed surface vehicles represent advanced ocean observing technologies that are revolutionizing both our understanding of and ability to forecast hurricane track and intensity. Observations from these platforms will provide new insights into the coevolution and coupling of the ocean and atmosphere to better predict storm intensity.

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| Title     | Simple relationships between residence time and annual nutrient retention, export, and loading for estuaries  |
| Author(s) | <b>Shen, J.</b> , Du, J., Lucas, L.V.   |
| Link      | <a href="https://doi.org/10.1002/lno.12045">https://doi.org/10.1002/lno.12045</a>   |
| Journal   | Limnology and Oceanography 67(4), 918-933 (2022).   |
| Summary   | Both the amount of nutrient input and the nutrient retention time contribute to the formation and severity of eutrophication in a waterbody. The study presents a simplified model that provides insight into the importance of residence time controlling transport and retention of pollutants. The model shows the underlying physical and biological processes for the well-known empirical relationship between residence time pollutant retention in waterbodies. The model is general and is applicable for nutrients and different pollutants. The application of the simple model demonstrates that annual nutrient loading to the Chesapeake Bay can be correctly estimated using residence time, measured nutrient concentration, and nutrient removal rate. |

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| Title     | Freshwater transport in the Scotian shelf and its impacts on the Gulf of Maine salinity   |
| Author(s) | <b>Wang, Z.</b> , Li, D., Xue, H., Thomas, A.C., <b>Zhang, Y.J.</b> , Chai, F.  |
| Link      | <a href="https://doi.org/10.1029/2021JC017663">https://doi.org/10.1029/2021JC017663</a>   |
| Journal   | Journal of Geophysical Research: Oceans, 127 (1), art. no. e2021JC017663 (2022).  |
| Summary   | In this study, we built an ocean circulation model around New England area and verified the model performance in capturing the variations of water level, velocity, temperature, and salinity. We used this model to analyze the movement of freshwater content that is contained in the seawater on the Scotian Shelf (SS) in 2017–2018, and studied its influence on the salinity in the downstream Gulf of Maine (GoME). |

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| Title     | Vertical transport timescale of surface-produced particulate material in the Chesapeake Bay   |
| Author(s) | * <b>Xiong, J.</b> , <b>Shen, J.</b>  |
| Link      | <a href="https://doi.org/10.1029/2021JC017592">https://doi.org/10.1029/2021JC017592</a>   |
| Journal   | Journal of Geophysical Research: Oceans, 127 (2), art. no. e2021JC017592 (2022).  |
| Summary   | The particulate organic matter produced from spring phytoplankton bloom is suggested to fuel the summertime near-bottom hypoxia in Chesapeake Bay. In this study, we aim to quantify the downward transport time and found that 1-3 months are generally required for the surface particulate material to reach the bottom water layer. |

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| Title     | Modeling polar marine ecosystem functions guided by bacterial physiological and taxonomic traits  |
| Author(s) | Kim, H.H., Bowman, J.S., Luo, Y.-W., Ducklow, H.W., Schofield, O.M., Steinberg, D.K., Doney, S.C.   |
| Link      | <a href="https://doi.org/10.5194/bg-19-117-2022">https://doi.org/10.5194/bg-19-117-2022</a>   |
| Journal   | Biogeosciences, 19 (1), pp. 117-136 (2022).   |
| Summary   | A bacteria-oriented ecosystem model was developed to examine links between different bacteria physiological traits and ecosystem functions (e.g., sinking particle export) in the coastal western Antarctic Peninsula –a region of rapid climate warming. |

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| Title     | Primary productivity in the mid-Atlantic Bight: Is the shelf break a location of enhanced productivity?  |
| Author(s) | Ma, J., <b>Smith, W.O., Jr.</b>  |
| Link      | <a href="https://doi.org/10.3389/fmars.2022.824303">https://doi.org/10.3389/fmars.2022.824303</a>  |
| Journal   | Frontiers in Marine Science, 9, art. no. 824303 (2022).  |
| Summary   | We assessed the distribution of primary productivity in the Mid-Atlantic Bight in three cruises to test if phytoplankton growth was enhanced at the shelf break by mesoscale oceanographic features. We found that productivity at the shelf break was not significantly greater than elsewhere, although there was substantial variability in space and time. |

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| Title     | Ephemeral surface chlorophyll enhancement at the New England shelf break driven by Ekman restratification  |
| Author(s) | Oliver, H., Zhang, W.G., Archibald, K.M., Hirzel, A.J., <b>Smith, W.O., Jr.</b> , Sosik, H.M., Stanley, R.H.R., McGillicuddy, D.J., Jr.  |
| Link      | <a href="https://doi.org/10.1029/2021JC017715">https://doi.org/10.1029/2021JC017715</a>  |
| Journal   | Journal of Geophysical Research: Oceans, 127 (1), art. no. e2021JC017715 (2022).   |
| Summary   | A number of oceanographic features at the shelf break in the Mid-Atlantic Bight can in theory result in enhanced phytoplankton growth. We found that under one situation that stratification was enhanced by local winds, and in conjunction with adequate nutrients, increased phytoplankton growth and accumulation. |

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| Title     | New technologies aid understanding of the factors affecting Adélie penguin foraging   |
| Author(s) | <b>Smith, W.O., Jr.</b> , Ainley, D.G., Heywood, K.J., Ballard, G.  |
| Link      | <a href="https://doi.org/10.5670/oceanog.2021.supplement.02-10">https://doi.org/10.5670/oceanog.2021.supplement.02-10</a>   |
| Journal   | Oceanography, 34 (4), pp. 26-27 (2021).   |
| Summary   | This article describes the new technologies that are being used to understand penguin foraging and behavior in the Antarctic. These technologies include attaching sensors to penguins as well as autonomous vehicles collecting information on water properties and prey quantity and composition. |

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| Title     | Unresolved taxonomy confounds invasive species identification: The <i>Lysmata vittata</i> Stimpson, 1860 (Decapoda: Caridea: Lysmatidae) species complex and recent introduction of <i>Lysmata vittata</i> sensu stricto in the western Atlantic   |
| Author(s) | Aguilar, R., Prakash, S., Ogburn, M.B., Lohan, K.M.P., Macdonald, K.S., Driskell, A.C., Ahyong, S.T., Leray, M., Mcilroy, S.E., <b>Tuckey, T.D.</b> , Antonio Baeza, J.  |
| Link      | <a href="https://doi.org/10.1093/jcbiol/ruab079">https://doi.org/10.1093/jcbiol/ruab079</a>  |
| Journal   | Journal of Crustacean Biology, 42 (1), art. no. ruab079 (2022).  |
| Summary   | Peppermint shrimp, native to the Indo-West Pacific, were found in Chesapeake Bay in 2013. Our attempt to identify the shrimp to species resulted in confusion as there were conflicting descriptions of the species and inconsistent terminologies used to describe the characteristics used to separate the species. We worked with others around the world to sort through the different peppermint shrimp species and determined that the one found in Chesapeake Bay is <i>Lysmata vittata</i> . |

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| Title     | Development of an individual-based tag recapture model to benchmark biomass and harvest rates in an iconic lobster fishery   |
| Author(s) | de Lestang, S., <b>Hoening, J.</b> , How, J.   |
| Link      | <a href="https://doi.org/10.5343/bms.2021.0026">https://doi.org/10.5343/bms.2021.0026</a>  |
| Journal   | Bulletin of Marine Science, 98 (1), pp. 27-50 (2022).  |
| Summary   | This study assessed the validity of a new fisheries model for the West Coast Rock Lobster Managed Fishery. Estimates from two models were compared to one another and produced very similar results. Both models indicate the fishery is sustainable and not being overfished. |

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Title Ecological equivalency of living shorelines and natural marshes for fish and crustacean communities

Author(s) **\*Guthrie, A.G., Bilkovic, D.M., Mitchell, M.,** Chambers, R., Thompson, J.S., **Isdell, R.E.**

Link <https://doi.org/10.1016/j.ecoleng.2021.106511>

Journal Ecological Engineering, 176, art. no. 106511 (2022).

Summary Living shorelines are erosion control structures that recreate natural shorelines, such as marshes, but it was unclear how well living shorelines provide habitat for fish and crustacean (nekton). We found that nekton use younger and older living shorelines similarly to nearby natural marshes, and provide suitable habitat for juveniles.

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Title Contribution of longshore sand exchanges to mesoscale barrier-island behavior: Insights from the Virginia Barrier Islands, U.S. East Coast

Author(s) **\*Robbins, M.G., \*Shawler, J.L., Hein, C.J.**

Link <https://doi.org/10.1016/j.geomorph.2022.108163>

Journal Geomorphology, 403, art. no. 108163 (2022).

Summary This paper documents changes in the shape, area, and volume of the 13 Virginia Barrier Islands over the past ~160 years. We explore the changes in the islands' behavior between growth, erosion, elongation, segmentation, and migration over time, and link these to sea-level rise, storms, and changes sand delivery rates.

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Title A geospatial modeling approach to assess site suitability of living shorelines and emphasize best shoreline management practices

Author(s) **Nunez, K., Rudnicky, T., Mason, P., Tomblason, C., Berman, M.**

Link <https://doi.org/10.1016/j.ecoleng.2022.106617>

Journal Ecological Engineering, 179, art. no. 106617 (2022).

Summary The Shoreline Management Model is a novel geospatial approach that assesses conditions along a shoreline, and recommends BMPs for defended and undefended shorelines. It provides a robust screening tool for local/state governments, coastal planners/engineers, and property owners, when considering BMPs, including living shorelines as an alternative for erosion control.

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Title Blooms of the harmful algae *Margalefidinium polykrikoides* and *Alexandrium monilatum* alter the York River Estuary microbiome

Author(s) **\*Fortin, S.G., Song, B., Anderson, I.C., Reece, K.S.**

Link <https://doi.org/10.1016/j.hal.2022.102216>

Journal Harmful Algae, 114, art. no. 102216 (2022).

Summary The article investigates the changes in the microbial community associated with blooms of the harmful algae *Margalefidinium polykrikoides* and *Alexandrium monilatum* in the York River. Blooms of both species resulted in different changes to the microbial community and water chemistry with potential impacts on carbon and nitrogen cycling.

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Title Nitrogen reductions have decreased hypoxia in the Chesapeake Bay: Evidence from empirical and numerical modeling

Author(s) **Frankel, L.T., Friedrichs, M.A.M., St-Laurent, P.,** Bever, A.J., **Lipcius, R.N.,** Bhatt, G., Shenk, G.W.

Link <https://doi.org/10.1016/j.scitotenv.2021.152722>

Journal Science of the Total Environment, 814, art. no. 152722 (2022).

Summary In this study, the impact of 35-years of nutrient management efforts on hypoxia in the Chesapeake Bay is quantified using both statistical and 3-D numerical modeling analyses. Results show that although nutrient reductions have been effective in curtailing hypoxic volume, warming temperatures have already offset 6-34% of these hypoxia improvements.

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Title Bioaccumulation of PCBs, OCPs and PBDEs in marine mammals from west Antarctica

Author(s) Khairy, M., **Brault, E., Dickhut, R.,** Harding, K.C., Harkonen, T., Karlsson, O., Lehnert, K., Teilmann, J., Lohmann, R.

Link <https://doi.org/10.3389/fmars.2021.768715>

Journal Frontiers in Marine Science, 8, art. no. 768715 (2021).

Summary To understand the bioaccumulation and food web dynamics of persistent organic pollutants (POPs) blubber samples of three killer whales and 77 pinnipeds were collected from the Southern Ocean, Antarctica. Killer whales typically displayed several times greater concentrations of POPs compared to seals and POPs concentration correlated with indicators of possible immunotoxic and deleterious health effects.

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| Title     | A deterministic model for understanding nonlinear viral dynamics in oysters  |
| Author(s) | <b>Qin, Q., Shen, J., Reece, K.</b>  |
| Link      | <a href="https://doi.org/10.1128/aem.02360-21">https://doi.org/10.1128/aem.02360-21</a>  |
| Journal   | Applied and Environmental Microbiology, 88 (8) (2022).   |
| Summary   | The paper introduces a new mathematical model that includes key processes for viral dynamics in oysters, such as oyster filtration, viral replication, the antiviral immune response, apoptosis, autophagy, and selective accumulation. We evaluate the model performance for two groups of viruses, those that replicate in oysters (e.g., ostreid herpesvirus) and those that do not (e.g., norovirus), and show that this model simulates well the viral dynamics in oysters for both groups. The model analytically explains experimental findings and predicts how changes in different physiological processes and environmental conditions nonlinearly affect in-host viral dynamics. |

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| Title     | Reconciling models and measurements of marsh vulnerability to sea level rise   |
| Author(s) | <b>Coleman, D.J.</b> , Schuerch, M., Temmerman, S., Guntenspergen, G., Smith, C.G., <b>Kirwan, M.L.</b>  |
| Link      | <a href="https://doi.org/10.1002/lol2.10230">https://doi.org/10.1002/lol2.10230</a>  |
| Journal   | Limnology and Oceanography Letters, 7 (2), pp.140-149 (2022).  |
| Summary   | Across broad scales, the amount of sediment in the water is strongly related to marsh accretion. The scientific debate between models and field measurements on what is the maximum rate of accretion can be partially explained by the difference between high and low elevation marshes, with the latter able to accrete more rapidly. |

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| Title     | Temperature optimum for marsh resilience and carbon accumulation revealed in a whole-ecosystem warming experiment   |
| Author(s) | * <b>Smith, A.J.</b> , Noyce, G.L., Megonigal, J.P., Guntenspergen, G.R., <b>Kirwan, M.L.</b>   |
| Link      | <a href="https://doi.org/10.1111/gcb.16149">https://doi.org/10.1111/gcb.16149</a>   |
| Journal   | Global Change Biology, 28 (10), pp. 3236-3245 (2022).   |
| Summary   | In this whole-ecosystem warming experiment our objective was to understand how future elevated temperatures influence elevation, carbon accumulation, and ecosystem resilience in coastal marshes. We found that moderate warming optimizes root growth, vertical accretion, and carbon accumulation, but elevation loss, marsh degradation, and increased decomposition at higher temperatures indicate nonpermanent benefits as global temperatures continue to rise. |

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| Title     | Benthic biofilm potential for organic carbon accumulation in salt marsh sediments   |
| Author(s) | <b>Valentine, K.</b> , Hotard, A., Elsey-Quirk, T., Mariotti, G.  |
| Link      | <a href="https://doi.org/10.1007/s13157-021-01528-0">https://doi.org/10.1007/s13157-021-01528-0</a>   |
| Journal   | Wetlands, 42 (1), art. no. 7 (2022).  |
| Summary   | Coastal wetlands have a high potential for carbon accumulation and storage, typically attributed to the high plant production. This paper demonstrates, using laboratory experiments, that microalgae can substantially contribute to carbon in salt marshes. Furthermore, we show that the rate of carbon storage by microalgae increases with increasing sediment deposition. |

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