

Research Digest

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VIMS

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VIRGINIA INSTITUTE OF MARINE SCIENCE



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Title Hidden vulnerability of U.S. Atlantic coast to sea-level rise due to vertical land motion

Author(s) Ohenhen L.O. Shirzaei M., Ojha C., **Kirwan M. L.**

Journal Nature Communications 14, art no. 2038 (2023)

Link <https://doi.org/10.1038/s41467-023-37853-7>

Summary Subsidence is a large component of relative sea level rise, and generally underestimated along the U.S. Atlantic coast.

Title Geomorphic and ecological constraints on the coastal carbon sink

Author(s) **Kirwan M.L.**, Megonigal J.P., Noyce G.L., **Smith A.J.***

Journal Nature Reviews Earth and Environment 4: 393 - 406 (2023)

Link <https://doi.org/10.1038/s43017-023-00429-6>

Summary Various processes that regulate the strength of the coastal carbon sink are generally offsetting. For example, salinization of freshwater ecosystems reduces methane emissions, and offsets the loss of carbon sequestration in submerging marshes and forests.

Title Comparing two ocean biogeochemical models of Chesapeake Bay with and without the sulfur cycle instead highlights the importance of particle sinking, burial, organic matter, nitrification and light attenuation.

Author(s) Jin, R., Pradal M.A., Hantsoo, K., Gnanadesikan, A., **St-Laurent, P.**, Bjerrum, C.J.

Journal Ocean Modelling 182, art no. 102175 (2023)

Link <https://doi.org/10.1016/j.ocemod.2023.102175>

Summary In this paper authors highlight future challenges to modeling Chesapeake Bay's sulfur cycle.

Title Krill body size drives particulate organic carbon export in West Antarctica

Author(s) Trinh R., Ducklow H.W., **Steinberg D.K.**, Fraser W.R.

Journal Nature 618: 526-530 (2023)

Link <https://doi.org/10.1038/s41586-023-06041-4>

Summary Antarctic krill body size, not regional environmental factors, exert the dominant control on carbon export along the Antarctic Peninsula through production and export of size-varying krill fecal pellets. Shifts in the krill population due to warming and sea ice decrease may alter ocean carbon export and storage.

Title A global review of catch efficiencies of towed fishing gears targeting scallops.

Author(s) Delargy A.J., Blackadder L., Bloor I., McMinn C., **Rudders D.B.**, Szostek C.L., Dobby H., Kangas M., Stewart B.D., Williams J.R. and Stokesbury K.D.

Journal Reviews in Fisheries Science & Aquaculture 31(3), pp. 296-319 (2023)

Link <https://doi.org/10.1080/23308249.2022.2139170>

Summary The efficiency of a towed fishing gear used to catch the target species is an important consideration for commercial fishing operations, scientific surveys, and assessments of natural finfish and shellfish populations. Towed gears are used worldwide to harvest a wide range of scallop species. In this paper, we review all aspects associated with the range of towed gears used to harvest scallops.

Title Decreased tourism during the COVID-19 pandemic positively affects reef fish in a high use marine protected area

Author(s) **Weng K.C.**, Friedlander A.M., Gajdzik L., Goodell W., Sparks R.T.

Journal PLoS ONE 18(4): e0283683 (2023)

Link <https://doi.org/10.1371/journal.pone.0283683>

Summary COVID shut down tourism, causing a “natural experiment” to measure the effects of human presence on fish habitat use. We took this opportunity to study a high-use, no-take marine protected area (MPA). When humans were away, fishes increased their use of the shallow reefs, particularly larger carnivorous species.

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Title Natural transmission of *Hematodinium perezii* in juvenile blue crabs (*Callinectes sapidus*) in the laboratory

Author(s) **Chen X.***, **Reece K.S.**, **Shields J.D.**

Journal Journal of Invertebrate Pathology 198, art no. 107918 (2023)

Link <https://doi.org/10.1016/j.jip.2023.107918>

Summary This study successfully established the transmission of *Hematodinium perezii*, a parasitic dinoflagellate in juvenile blue crabs in the laboratory for the first time. Infection developed rapidly at 25°C, suggesting that high seasonal temperature in natural systems could be critical to the transmission of this parasite.

Title Acute inhibition of bacterial growth in coastal seawater amended with crude oils with varied photoreactivities

Author(s) Headrick E.L., Nigro L.M., Waidner L.A., Ederington-Hagy M., Simmering A.L., **Snyder R.A.**

Journal Frontiers in Ecology and Evolution 11, art no. 1113899 (2023)

Link <https://doi.org/10.3389/fevo.2023.1113899>

Summary Shifts in the bacteria community will occur as microbes respond to an oil spill and the system recovers to pre-spill condition. Light exposure is often not included in experiments examining the effect of microbial degradation of crude oil, but chemical alterations from light exposure as would happen in nature can have significant effects on bacteria and their degradation of crude oil.

Title Induced defenses as a management tool: Shaping individuals to their environment.

Author(s) Belgrad B.A., Knudson W., Roney S.H., **Walton W.C.**, Lunt J., Smee D.L.

Journal Journal of Environmental Management 338, art no. 117808 (2023)

Link <https://doi.org/10.1016/j.jenvman.2023.117808>

Summary In this study, we tested if oysters, *Crassostrea virginica*, raised under commercial hatchery conditions with chemical cues from two common predator species can improve survival across a variety of environments. Predator-induced changes (including shell strengthening) significantly increased oyster survival up to 600%.

Title The outsized role of salps in carbon export in the subarctic northeast Pacific Ocean

Author(s) **Steinberg D.K.**, **Stamieszkin K.**, Maas A.E., Durkin C.A., Passow U., Estapa M.L., Omand M.M., McDonnell A.M.P., Karp-Boss L., Galbraith M., Siegel D.A.

Journal Global Biogeochemical Cycles 37(1), art no. e2022GB007523 (2023)

Link <https://doi.org/10.1029/2022GB007523>

Summary High abundances of salps (gelatinous, pelagic tunicates), combined with unique features of salp ecology and physiology, led to their outsized role in carbon export in the northeast Pacific Ocean during summer.

Title	Depth drives the distribution of microbial ecological functions in the coastal western Antarctic Peninsula.
Author(s)	Dutta A., Connors E., Trinh R., Erazo N., Dasarathy S., Ducklow H.W., Steinberg D.K. , Schofield O.M., Bowman J.S.
Journal	Frontiers in Microbiology 14: 1168507 (2023)
Link	https://doi.org/10.3389/fmicb.2023.1168507
Summary	A novel molecular approach was used to understand differences in microbial community functions across depth and region in the coastal Antarctic. Microbial community functions were largely partitioned based on depth. A valuable sequence library resulted, which is available for future Antarctic genomics research.

Title	Seasonal and interannual changes in a coastal Antarctic zooplankton community.
Author(s)	Conroy J.A. , Steinberg D.K. , Thomas M.I.* , West L.T.
Journal	Marine Ecology Progress Series 706: 17-32 (2023)
Link	https://doi.org/10.3354/MEPS14256
Summary	Seasonal fluctuations in a coastal Antarctic marine zooplankton community indicate species shifted their phenology between years in response to the timing of sea ice breakup and the onset of phytoplankton blooms. The timing of seasonal succession of zooplankton species reflected a wide array of adaptations within zooplankton life cycles.

Title	Spring phytoplankton distributions and primary productivity in waters off northern Norway
Author(s)	Meng R., Smith W.O. , Basedow S.L.
Journal	Journal of Marine Systems 240, art no. 103891 (2023)
Link	https://doi.org/10.1016/j.jmarsys.2023.103891
Summary	The distribution of phytoplankton was assessed off the coast of Norway and compared to the long-term mean distributions, as well as the relationship to copepods.

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Title Sensitivity of the relationship between Antarctic ice shelves and iron supply to projected changes in the atmospheric forcing.

Author(s) Dinniman, M.S., **St-Laurent, P.**, Arrigo, K.R., Hofmann, E.E., van Dijken, G.L.

Journal Journal of Geophysical Research: Oceans 128, e2022JC019210 (2023)

Link <https://doi.org/10.1029/2022JC019210>

Summary This paper examines how future climate change will modify iron availability for algal photosynthesis in a region known to be a sink of atmospheric carbon dioxide.

Title Global seamless tidal simulation using a 3D unstructured-grid model (SCHISM v5.10.0)

Author(s) **Zhang Y.J.**, Fernandez-Montblanc T., Pringle W., **Yu H.C.**, **Cui L.**, Moghimi S.

Journal Geoscientific Model Development 16(9): 2565-2581 (2023)

Link <https://doi.org/10.5194/gmd-16-2565-2023>

Summary Accurate flooding prediction is essential for coastal resilience but is complicated by multiple physical factors (ocean, river, and atmosphere). We made significant progress toward a holistic forecasting of inland-coastal flooding using sophisticated numerical models, and we have worked with NOAA and international agencies to operationalize our tools to benefit the coastal communities.

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Topic **Anthropogenic Impacts**

Title	Relative contribution of the presence of an estuarine dam and land reclamation to sediment dynamics of the Nakdong Estuary.
Author(s)	Chang J., Lee G.H., Harris C.K. , Figueroa S.M., Jung N.W.
Journal	Frontiers in Marine Science 10: 1101658 (2023)
Link	https://doi.org/10.3389/fmars.2023.1101658
Summary	A coupled wave, hydrodynamic, and sediment transport model was used to evaluate the impacts on sediment transport of anthropogenic modifications of the Nakdong River Estuary in South Korea. The impacts of dam construction were compared to those of large land reclamation projects.

Topic **Coastal Geology**

Title	Holocene barrier overstepping, estuarine rollover and drainage merging in a sub-tropical bay
Author(s)	Galvão W.F.L., Klein A.H.d.F., Mahiques M.M.d., Hein C.J. , Sousa L.A.P.d., Cooper A., Green A.
Journal	Marine Geology 462, art no. 107076 (2023)
Link	https://doi.org/10.1016/j.margeo.2023.107076
Summary	This study details the evolution of an estuary in southern Brazil during a period of rising sea level and intense sedimentation over the last 8000 years.

Topic **Shorelines**

Title	Socioeconomic vulnerability and climate risk in coastal Virginia
Author(s)	Eghdami S., Scheld A.M. , Louis G.
Journal	Climate Risk Management 39, art no. 100475 (2023)
Link	https://doi.org/10.1016/j.crm.2023.100475
Summary	Property owners in VA who had applied for a shoreline modification permit were surveyed to understand related motivations and perceptions. While the ecological benefits of living shorelines were widely perceived, results suggest a need for increased education and outreach to communicate the protection and adaptation benefits of living shorelines.

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