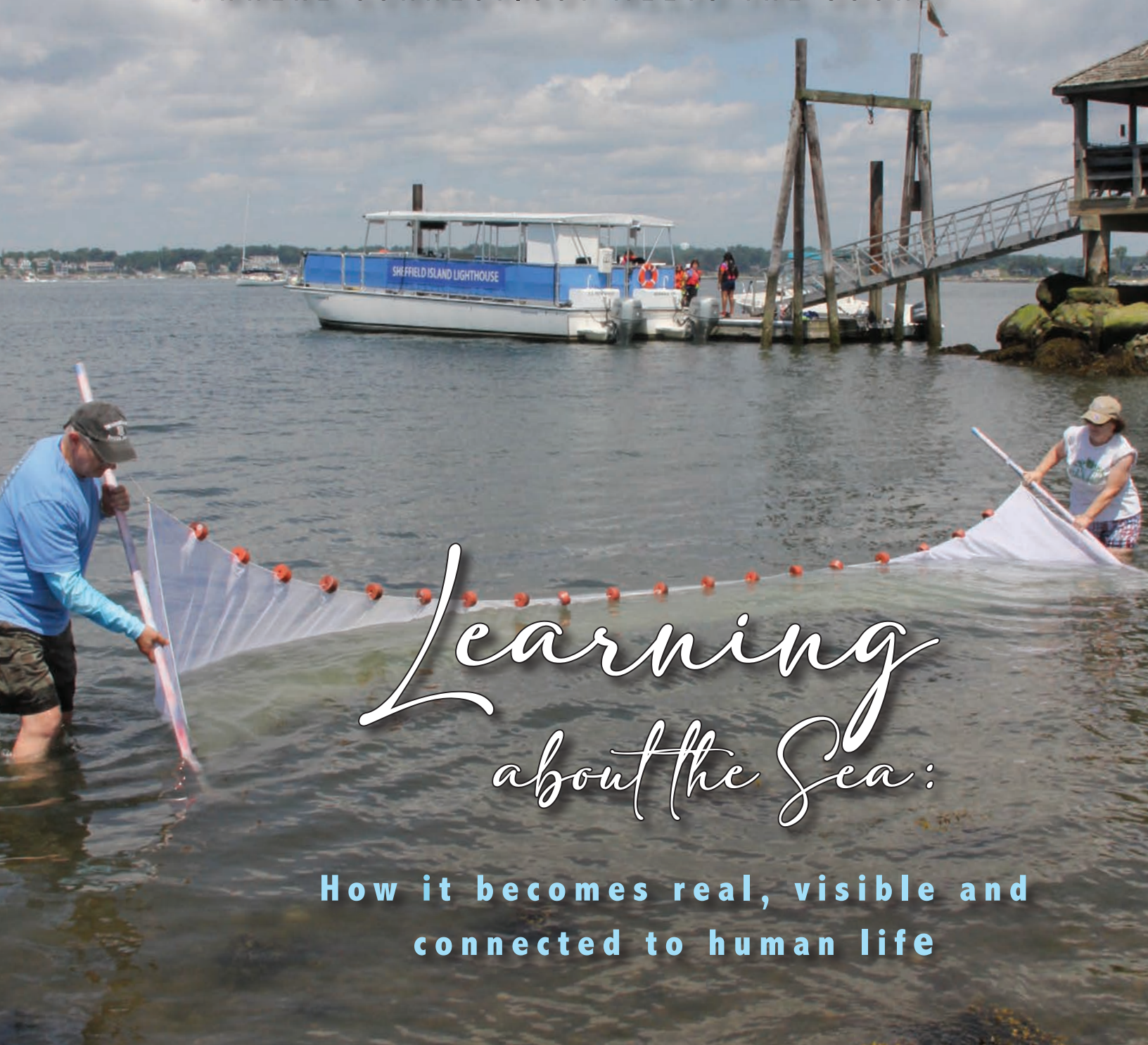




Volume 23, Number 2, Fall/Winter 2023/24

WRACKLINES

WHERE CONNECTICUT MEETS THE SOUND



*Learning
about the Sea:*

**How it becomes real, visible and
connected to human life**

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From the EDITOR

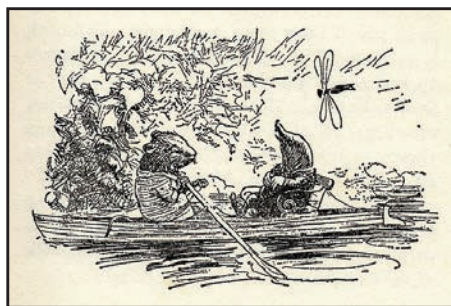
Waves galloped like white horses in the waters off the UConn Avery Point campus on the morning of the “Messing About in Boats” event on Sept. 15.

A storm brewed offshore, making for less-than-ideal conditions for a day of rowing, kayaking and fishing activities for students, organized by the newly established Connecticut National Estuarine Research Reserve (CT NERR) and CT Sea Grant, Avery Point campus, Project Oceanology and the John Gardner Chapter of the Traditional Small Craft Association. But the attentive and knowledgeable staff and volunteers who led the boating took extra care to give thorough instructions and keep a close eye when students wielded oars, paddles and fishing poles. Many of the 60 students were first-timers to water sports.

Early in the day, one young woman screamed and jumped out of a rowboat while it was still on the beach. She had just been soaked by a rogue wave. She left the beach, too fearful to venture from shore. Philip Beheny, the small craft association volunteer leading the rowing, acted with wisdom and compassion. He moved the rowboats from the beach to a nearby dock. There, skittish students could feel more comfortable learning to use the oars in a cove behind a breakwater, while he stood on the dock holding a line attached to the bow of their boat. The young woman who jumped out of the boat later got back in from the dock, her confidence restored.

During the kayaking trips, Prescott Littlefield, waterfront programs manager at Avery Point, decided mid-morning to shepherd groups from an engine-powered Boston Whaler instead of a kayak, so he could respond more quickly if students needed help.

He and Beheny did what the best teachers do: adjusted their plans to meet their students where they were. That was one of the reasons “Messing About in Boats” turned out to be good experience for participants despite the raucous weather. In surveys afterward, most said they’d like to do it again next year.




The event took its name from a famous quote in Kenneth Grahame’s *Wind in the Willows*, the classic children’s book. The main character, Water Rat, tells his friend Mole:

“Believe me, my young friend, there is nothing—absolutely nothing—half so much worth doing as simply messing about in boats. In or out of ‘em, it doesn’t matter. Nothing seems to matter; that’s the charm of it. Whether you get away, or whether you don’t; whether you arrive at your destination or whether you reach somewhere else, or whether you never get anywhere at all, you’re always busy, and you never do anything in particular.”

Doubtless this passage has inspired many to try boating or fueled an already budding passion. Maybe the experience at Avery Point had the same effect for some of the participants. But, as the quote suggests, that’s not really what matters. Instead, it’s the experience of being on the water, in whatever way you can, that resets our perspective. This was one of the valuable lessons at least some of the participants surely took from “Messing About in Boats.”

In all, “Messing About in Boats” was a day of learning, not in the traditional classroom sense, but through the classroom of the sea that can be even more powerful. It was one demonstration of the theme of this issue. As the articles relate, the many ways of learning about marine science can come from classroom aquariums, field trips and from building and launching a small, unmanned sailboat. Marine learning can also be enhanced by researchers and educators who study how and what people learn about the ocean, how they are affected by it and work to promote more widespread knowledge of the marine world. And then, of course, there are the invaluable lessons learned by simply spending time in nature, listening to the water, as the Mole discovered:

“The Mole was bewitched, entranced, fascinated. By the side of the river he trotted as one trots, when very small, by the side of a man who holds one spell-bound by exciting stories; and when tired at last, he sat on the bank, while the river still chattered on to him, a babbling procession of the best stories in the world, sent from the heart of the earth to be told at last to the insatiable sea.”


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Cover: Teachers drag a seine net at Sheffield Island during a Long Island Sound Mentor Teacher workshop in July. Above: Illustration by Ernest H. Shephard from the 1933 edition of *Wind in the Willows*, published by Charles Scribner’s Sons.

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Ralph Lewis, Connecticut state geologist from 1998 to 2003, is a certified professional geologist with 48 years of experience and is author of more than 100 articles on the geology of Long Island Sound. He is a professor-in-residence in the Marine Sciences Department at the University of Connecticut/Avery Point and a member of the Connecticut Academy of Science and Engineering. Lewis is a former member of the Ocean Studies Board of the National Academies of Science and received the Dr. Sigmund Abeles Award from the Connecticut Science Teachers Association.



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Judy Benson has been communications coordinator at Connecticut Sea Grant and editor of *Wrack Lines* since 2017. Before that, she was a newspaper reporter and editor, concluding her journalism career at *The Day* of New London covering health and the environment. She is the author of a book created in collaboration with artist Roxanne Steed: *Earth and Sky: Nature Meditations in Word and Watercolor*, published in 2021 by New London Librarium. She earned both a bachelor's degree in journalism and a Master of Science in natural resources from UConn.



The Serendipitous Transatlantic Tale of One Tiny but Mighty Boat

By Syma A. Ebbin

*Just sit right back and
you'll hear a tale,
A tale of a fateful trip
That started from an ocean port
Aboard a tiny ship.
(slightly modified lyrics from the theme song to the
TV show "Gilligan's Island")*

No, this isn't a tale about castaways. Rather it is a tale of an unmanned miniature sailboat and the people it connected.

Hailing from five different countries, they were linked by the ocean currents and winds that propelled the small but mighty vessel named the *Lancer* forward. Even more significant than the connections created was the impact that its voyages have had in amplifying ocean literacy around the world.

The story began in 2015 when Kaitlyn Dow, an avid sailor and student at Waterford High School, enrolled in a university-level oceanography class taught by science teacher Michael O'Connor. The course spanned the school year, allowing students to undertake year-long research projects.



Kaitlyn Dow, rear center, joins Martha Shoemaker's fourth-grade students at Quaker Hill Elementary School to show off the drifter they helped assemble and decorate. Photo by Michael O'Connor



Kaitlyn Dow, left, carries the sailboat *Lancer* into Waterford High School's swimming pool with another student to test its buoyancy before its first launch into the Atlantic in 2016. Photo by Michael O'Connor

"At the time I was a competitive offshore sailor, traveling all over the country competing," Dow, currently a deck watch officer in the Coast Guard, recalled. "After struggling for a long time to come up with an idea for this project I decided to combine my interests in science and sailing."

Her project began when the concept of ocean literacy was being advanced for K-12 classrooms in the United States and abroad. This was the backdrop for the serendipitous journey of the *Lancer*.

At this time, O'Connor met Dick Baldwin, sailor and founder of the Maine-based non-profit Educational Passages (EP), at a marine educators conference. He saw the small kit-built sailboat that Baldwin's organization designs and sells.

The mission of EP is "connecting people around the world to the ocean and to each other, which is one of those essential ocean literacy steps," said Cassie Stymiest, currently the executive director of the organization.

"It's a very, very powerful mini and a mighty boat that is a springboard for so many different things," she said.

At the same conference, O'Connor learned that Connecticut Sea Grant might be a source of funding for the project. O'Connor worked with Dow to draft a request. Connecticut Sea Grant awarded the funding, augmented by the Captain Planet Foundation, paving the way for the *Lancer's* launch.

After realizing that sensors wouldn't be available for the launch, Dow modified the project to compare the movement of two different types of ocean-going instruments: one would have underwater sails that would ride the currents; the other would be the five-foot-long *Lancer*, a keeled sailboat that would catch

the winds and currents. Both would be outfitted with GPS units to track longitude and latitude, sending data several times daily.

O'Connor engaged teacher Martha Shoemaker and her class of fourth graders at the Quaker Hill Elementary School to help construct and decorate the first drifter, a buoy with four underwater spars attached to sails. Dow's classmates helped build and decorate the *Lancer*, named after the high school's mascot. After a test run in the school's pool, the hull was filled with small gifts and messages for whoever found it.

Both instruments were then launched at the edge of the continental shelf south of New York Bight on May 7, 2016, from the Woods Hole Oceanographic Institution's R/V *Neil Armstrong* during one of its first research cruises.

The voyages began!

The two instruments set out across the North Atlantic. The drifter traveled about halfway and stopped transmitting. The *Lancer*, however, glided over the continental shelf, underwater canyons and seamounts, caught the Gulf Stream, crossed the mid-Atlantic Ridge, and kept on sailing, nearing Ireland after four months.

Dow and O'Connor sent a letter to the Irish minister of education, as well as other contacts in Ireland to alert them to the imminent arrival of the *Lancer*:

"A fleet of miniature unmanned sailboats is preparing to invade the West Coast of Ireland. Not to worry, this is a friendly invasion... We are hoping you or anyone else could recover our boat before it gets damaged in the surf. This is part of a hands-



Méabh Ní Ghionnáin, left, met Kaitlyn Dow when Dow travelled to Ireland to reunite with the *Lancer*. Both are wearing their Sea Scout uniforms. Photo courtesy of The Irish Marine Institute

on learning program we are doing at Waterford High School... We are learning about oceanography, earth science, geography, navigation, and hope to have a meaningful international relations experience as well... Our boat is the *Lancer*... We are hoping students could meet her as she comes ashore or maybe your local fishermen can pick her up before she comes ashore. You'll find information about us in the watertight compartment and how you can email us for more information. Please take our boat to a nearby school so your students can learn as well... Let's work together, fix her up as needed and get her back to sea to continue her voyage. We'd love to see pictures and have a chance to Skype with you. Thank you."

The *Lancer* set ground not on the shore of an uncharted desert isle, but rather on rocky Garumna Island off the coast of



Cruise tracks of *Lancer's* three transatlantic voyages are shown on this map. During its first cruise in 2016, shown in blue, it travelled from the edge of the North American continental shelf to Ireland; during its second in 2017, shown in purple, it sailed from the middle of the Atlantic Ocean to England. On its third cruise in 2022, shown in brown, it launched from the Canary Islands and landed in the Bahamas in 2023. Screen capture from Educational Passages

Galway on Sept. 17, 2016. O'Connor received an email the following day from Neasa Ní Chualáin:

"Hello Michael! We are delighted and very excited that we recovered the boat. The girl who recovered the boat is my daughter Méabh Ní Ghionnáin, who is 8 years old. She can't wait to return to school tomorrow morning (with boat in tow!) and tell her story and what a story..."

Dow and O'Connor traveled to Ireland to meet the young girl and reunite with the *Lancer*. The Connemara Sea Scout group, looking for a boat project to take on, adopted the *Lancer* to make the needed repairs, an ideal arrangement since both Dow and Méabh Ní Ghionnáin are Sea Scout members themselves. Connecticut Sea Grant agreed to provide more funding to refurbish the *Lancer* for the second journey. The Marine Institute of Ireland agreed to relaunch the *Lancer*.

The Connemara Sea Scouts and boat builder Ciaran Oliver, who works on traditional Irish wooden boats called Galway Hookers, started repairing the boat. In an email to O'Connor, Méabh's mother Neasa Ní Ghionnáin recalled the long and significant connection her daughter and family have to the sea:

"Méabh's Dad is a fisherman," she wrote. "Her grandfather used to fish and her great grandfather and great great grandfather were fishermen too! Her grandfather and uncles own and sail Galway Hookers— traditional wooden work boats that have survived on the Galway coast."

When the *Lancer* was restored, a dark red sail was attached to honor the Galway Hooker tradition.

The Marine Institute's R/V *Celtic Explorer* relaunched the boat in the middle of the Atlantic on April 22, 2017, due west of Ireland and about halfway to Labrador, Canada. The weather did start getting rough, and the tiny ship was tossed. On June 14, O'Connor posted on the *Lancer* Twitter account:

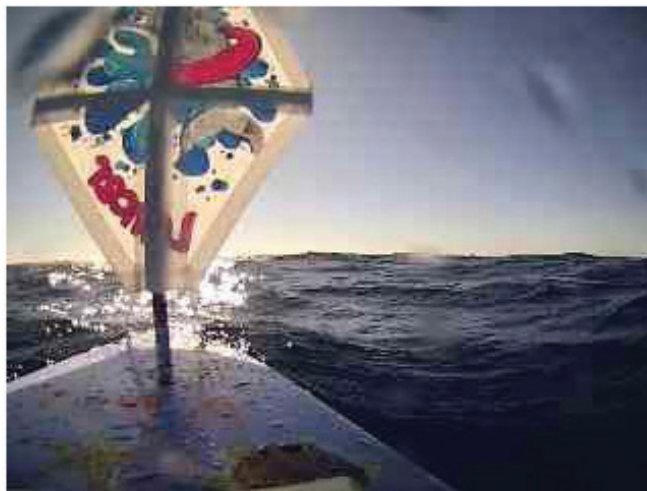
"*Lancer* has not transmitted for 36 hours. It looks like it is circling a huge drain. Gale force winds & 20-foot waves..."



Educational Passages
@miniboats: [Follow](#)



This little birdie is catching a ride on the miniboat *Lancer*! Any of our bird friends out there recognize the species? @MakerBuoy's sensor pack for the win on this awesome pic! @DrifterWhs @OceanCTrust @IEOocenaograpia @explorersedu



Top, the *Lancer*, missing its sail and mast at this point, picks up a hitchhiking seabird while moving south of Turks and Caicos on March 26, 2023. Center, the *Lancer* sails towards the Bahamas on March 7, 2023, under clear skies. Photos from camera onboard the *Lancer*



Waterford High School students stand with the fourth graders from Quaker Hill Elementary School who helped assemble and decorate the *Lady Lance* and an ocean drifter, launched in November 2022. Photo by Michael O'Connor

But the *Lancer* continued sailing, and on Aug. 4, 2017, its GPS announced it had arrived in a mooring field in the mouth of the River Yealms near the port of Newton Ferries in England. The boat was recovered and sent to a local school and put on a shelf.

While it sat shelved, the United Nations launched the Decade of Ocean Science for Sustainable Development, a focused time with broad aims of achieving the UN's Agenda 2030 ocean-related Sustainable Development Goals. The time for projects that advance ocean literacy had seemingly never been better.

The efforts to export the concept of ocean literacy were creating synergies observed by the many connections and interactions. In 2019, Stymiest met Nicola Bridge, president of the European Marine Science Educators Association. Bridge is also head of conservation education and communications at the Ocean Conservation Trust, based at the National Marine Aquarium in Plymouth, United Kingdom. This led to a partnership with that organization and the development of Project O.C.N. and associated STEMfest, an ocean and climate literacy program that engaged thousands of U.K. students. The *Lancer* was incorporated into the STEMfest project, refurbished, upgraded with a deck camera, two GPS units, sensors to collect air and water temperature data, as well as boat position and orientation.

The *Lancer* was relaunched on Dec. 1, 2022, from Tenerife in the Canary Islands, sailing west across the Atlantic. At the same time, O'Connor's class was building a sister ship, the *Lady Lance*, which was launched on Nov. 13, 2022. *Lady Lance* was successfully recovered in the Azores on May 12, 2023.

Ocean science is usually conceived of as *big* science. But according to the 2020 UN Global Ocean Science Report, average national investments in ocean science comprise only 1% of national research budgets, an amount that seems miniscule compared to the wealth of ocean resources that contribute to the global economy, estimated at \$1.5 trillion in 2010. Given this, exploring the role of *small* ocean science—science on the scale of a high school student, a five-foot boat and a small amount of Connecticut Sea Grant funding—seems vital.

Taking a big-picture view, the story of the *Lancer* is a dynamic example of the sixth of the seven ocean literacy principles: "The ocean and humans are inextricably interconnected." The ocean is often thought of as a barrier, but in actuality it is a means of linking people, materials and ideas. Even today, the *Lancer* continues to illustrate this. It made its way to the Bahamas, where it ended up with students at the NGM Major High School. Dow, traveling on her Coast Guard cutter, met up with it there—another bit of serendipity. Recently, the boat returned to Waterford High School.

"I am thankful this project is something students at my high school have chosen to continue," Dow said. "I am sure for

many students this is one of their first introductions to the maritime community. In my current role I work on the water daily and being able to introduce students to the maritime community is really important to me."

O'Connor said the *Lancer* demonstrated the power of experiential learning to engage students in ocean science.

"I think the *Lancer* provided a more interesting and personal hook to connect students to material that may be more dry," said O'Connor. "There's a lot of connections to ocean literacy. It was an opportunity to connect them to each other, to the content, and hopefully to the rest of the world."

Even at Quaker Hill elementary, the connections went deep. The fourth-grade class that helped build and decorate one of the original drifters also did activities about winds and currents and took a field trip on the Project Oceanology vessel to release coconut drifters that were recovered along the coast of Connecticut and New York. They had a virtual cultural exchange meeting with Méabh Ní Ghionnáin's school in Ireland.

"The cultural connections and ability to connect multiple ages is a key factor in the success of the program," O'Connor said.

Audrey Azoulay, UNESCO director-general, recently summed up the need to remain focused on ocean science.

"Ocean science is a journey—and one we are only just embarking on," she wrote. "Like navigators of old, we need to pool knowledge, join forces and stay on course."

Maybe what is required is engaged curiosity, appreciation and a bit of serendipity to achieve the ocean literacy needed to steward ourselves into a sustainable future. That's what the *Lancer* project brought to all the people involved.

"This program helps us take action in little bits, to understand what is needed and what we can do to solve problems," concluded Stymiest. "It's helping people navigate their own future."



Hosted by Ireland's Marine Institute, teacher Mike O'Connor, center, and Kaitlyn Dow, left front, travelled to Galway in February 2017 to reunite with the *Lancer* and meet Méabh Ní Ghionnáin, members of the Connemara Sea Scouts and boat builder Ciaran Oliver. In front of the group is the refurbished *Lancer* outfitted with traditional red sails and decorations depicting an historic Galway Hooker. Photo courtesy of The Irish Marine Institute



How a geologist comprehends the convoluted Connecticut coast

LEARNING FROM THE PAST TO MAKE BETTER DECISIONS IN THE PRESENT

By Ralph Lewis

Except as noted, all images from Connecticut's Sandy Shores

Editor's note: Geologically speaking, the Connecticut coast is complicated. It's also unique, unlike most others along the Atlantic seaboard.

In the new Connecticut Sea Grant-Connecticut College Arboretum book, **Connecticut's Sandy Shores: An Introduction to the Geology, Ecology, Plants and Animals**, retired State Geologist Ralph Lewis gives a detailed explanation of how the forces of nature have shaped our Long Island Sound shoreline. Accompanied by numerous illustrations and photos, the description gives a comprehensive picture of how so many site-specific variations occur from Greenwich to Stonington, underscoring the importance of understanding each area individually before undertaking a coastal project.

In this article, Lewis previews the chapter he wrote for the book by applying the information found there to an analysis of three sites: Meigs Point at Hammonasset Beach State Park in Madison; Rocky Neck State Park in East Lyme; and Bluff Point State Park in Groton.

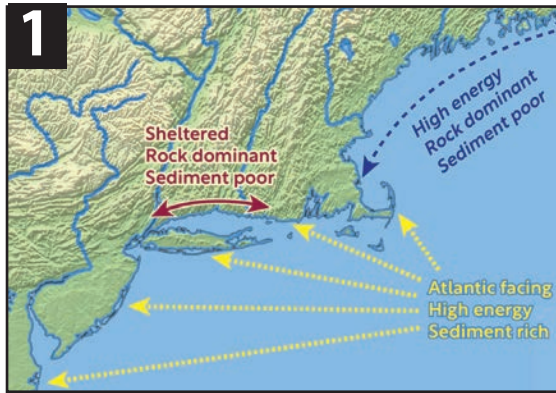


Figure 1. Image showing the regional distribution of three types of coastlines: a) Atlantic-facing, high-energy, highly-modified, sediment-rich coastline; b) high-energy, less-modified, irregular, rock-dominated, sediment-poor Gulf of Maine coast; and c) sheltered, very slightly modified, irregular, rock-dominated, often sediment-poor north shores of Long Island Sound.

In our area, the geologically diverse, irregular coast of Connecticut is sheltered from the high wave energy of the Atlantic Ocean by the presence of Long Island. This is a very different geologic setting than that of the comparatively homogeneous, sand-dominated shorelines of western Rhode Island, or southern Long Island, where easily transportable glacial sands and gravels are mobilized by high wave energy (Figure 1).

Owing to the protective presence of Long Island, wave energy in Long Island Sound (LIS) is comparatively low, and the coastline of Connecticut is composed of a variety of geologic materials, ranging from solid rock to fine sand and silt. The diverse geologic composition of the Connecticut coast has been nicely summarized in a report, with an accompanying map, authored by Arthur Bloom (Bloom, A.L, 1967, Figure 2). He describes the coast of Connecticut as being composed of a diverse set of geologic materials, each reacting to sea level rise and wave action differently.

Bloom divided the Connecticut coastline into seven coastal segments based on surficial deposits and bedrock exposures (Figure 2). He reported that only three of these areas show meaningful barrier beach development, and that the shape and physical makeup of Connecticut's irregular coastline results from the presence of the numerous points and necks (outlined in red, purple and black, Figure 3) that protrude into LIS because they are more resistant to wave action and sea-level rise than surrounding sandy/gravelly beaches and tidal marshes (yellow and green, Figure 3).

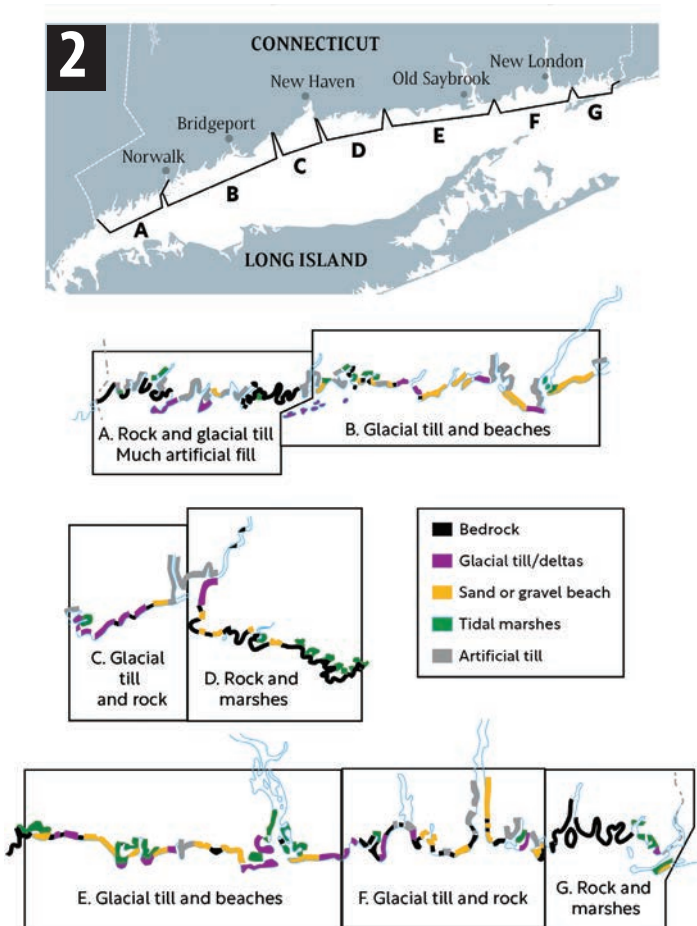


Figure 2 A-G. Connecticut's coastal types as adapted from Bloom (1967). Of the seven mapped areas, only segments (B) and (E) were categorized by Bloom as being composed primarily of glacial delta deposits with associated sand/gravel beaches and tidal marshes. The remaining segments are composed of bedrock and some combination of glacial sediment/marshes and artificial fill.

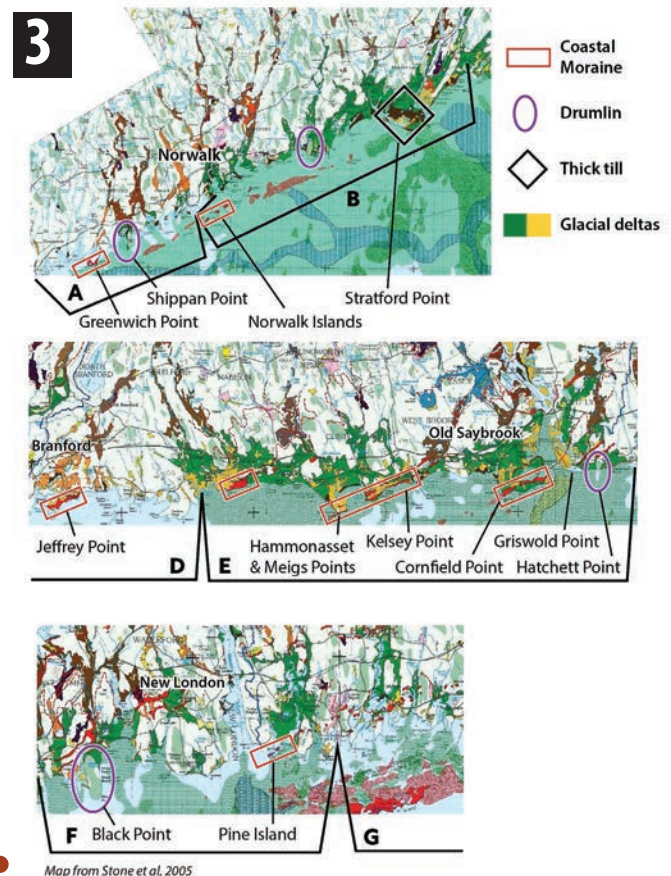


Figure 3 A-G. Excerpts from the Quaternary Geologic Map of Connecticut and Long Island Sound Basin (Stone, J.R, and others, 2005) showing the geology of Bloom's segments (A, B, D, E, F, and G). In addition to resilient bedrock outcrops, coastal moraines, drumlins and thick till deposits are commonly resilient enough to also form points and necks along the CT coast.

Left: A boulder-cobble-gravel beach (olive double arrow, Fig. 8) overlying solid bedrock that is being submerged in place.

In essence, the Connecticut coast is composed of whatever assortment of materials waves have to work with, and the irregularities that typify this shoreline result from the fact that each major shoreline component reacts to the rising waters of LIS differently because each has a set of physical characteristics that determine its resilience to wave action and sea-level rise. This discordant scenario of beach retreat works to maintain the coast's irregular shape which has implications for natural beach replenishment surrounding resilient points and necks.

Along the Connecticut coast, wave action against resilient points and necks seldom yields sufficient sediment to naturally replenish surrounding beaches. This paucity of nourishing sediment is further compounded by the fact that points and necks often act to interrupt the transport of sediment along the Connecticut coast because what wave energy is available is concentrated on the points and necks by wave refraction (Figure 4).

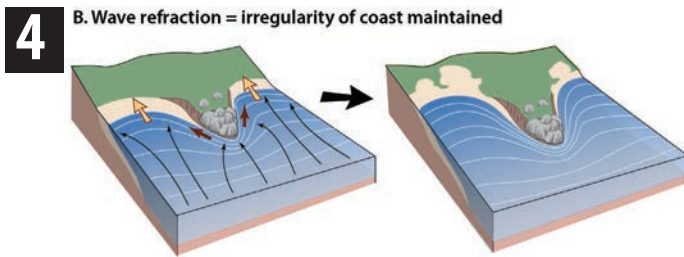


Figure 4 In the low-energy environment of the Connecticut coast, wave energy concentrated on a resilient point or neck by wave refraction (black arrows) typically yields little sediment, and what sediment is available is insufficient to adequately nourish surrounding sandy beaches through littoral transport (short brown arrows). Lacking an adequate supply of replenishing "outside" sediment, these beaches retreat landward faster than the adjacent, more resilient points or necks. As they retreat, they derive their "sandy" composition as wave action chews landward, through existing, sandy, glacial delta deposits and overlying marsh deposits (yellow arrows). The net result of all of this is perpetuation of coastal irregularity.

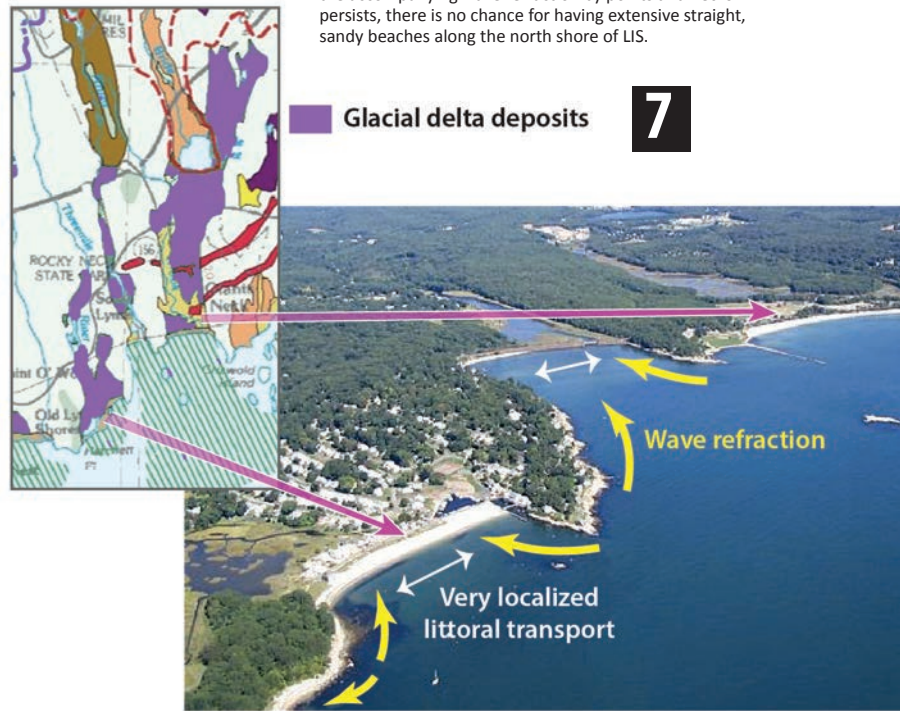
Figure 6. At Rocky Neck State Park, the resistant bedrock of the Lands End Peninsula is being submerged in place as LIS waters rise. Wave action against this type of bedrock point yields little or no sediment for replenishment of adjacent beaches. Photo: Ralph Lewis



Figure 5 An aerial view of the Hammonasset-Ledyard Moraine Photo: Joel Stocker

Map credit, An annotated digital quadrangle excerpt from Stone, and others, 2005 (Source: DEEP ECO Map Catalogue).

Figure 7. Along the irregular north shore of Long Island Sound, wave refraction acts to sequester sandy glacial delta deposits (purple) between partitioning points and necks. The irregular configuration of this heterogeneous coastline is perpetuated by the generally slow retreat of resilient points and necks and the more rapid retreat of less resilient, low-flat glacial deltaic deposits. As long as this differential retreat and the accompanying wave refraction by points and necks persists, there is no chance for having extensive straight, sandy beaches along the north shore of LIS.



Drone photo by Joel Stocker; inset map from Stone et al, 2005

A visit to a public access beach area that features sandy beaches and marshes surrounding a resilient point or neck is the best way to understand how the Connecticut coast is reacting to sea level rise. Three such beach areas are highlighted here.

HAMMONASSET BEACH STATE PARK

Meigs Point at **Hammonasset Beach State Park** in Madison is formed by a short segment of the Hammonasset-Ledyard Moraine (red, Figure 5 top). Extensive glacial delta sand and gravel deposits (GDS, Figure 5 top) and overlying marsh deposits (M Figure 5, top) lie landward of the moraine's protection.

When wave action attacks a moraine, finer sediments that form its matrix are winnowed out, leaving behind a resilient boulder cobble armor (Figure 5, bottom). Since this armored shoreline section is more resilient than the surrounding sandy glacial delta and marsh deposits, it retreats more slowly, and a moraine-armored point develops. The perspective offered by the photo at the bottom of Figure 5 clearly shows that wave-induced winnowing of matrix sediment from the short Meigs Point moraine segment could not possibly supply sufficient sand to replenish Hammonasset Beach to its left side. The sand composing the longest sandy beach in the state is being derived by waves chewing into the sand and gravel deposits of the largest coastal glacial delta in the state.

ROCKY NECK STATE PARK

In East Lyme, the sandy beach at **Rocky Neck State Park** is bounded on its eastern and western flanks by points that are composed of bedrock that is fairly solid and relatively free of weakness (e.g., layering and fracturing). Points and necks composed of this type of bedrock are highly resilient in the low wave energy environment of LIS because they are not easily exploited by wave action or other weathering agents like freeze-thaw and salt spray. Their glacially smoothed surfaces typically slope seaward and they are largely unaltered as the rising sea submerges them in place (Figure 6). Aside from a thin blanket of glacial till that is largely removed by the winnowing action of encroaching waves, this type of exposed solid bedrock yields precious little sediment for surrounding beach nourishment.

The Rocky Neck area is also a place where wave refraction associated with bedrock points induces landward littoral transport (yellow arrows, Figure 7) around the points. This tends to isolate sandy glacial deposits (purple, Figure 7 inset) because there is only localized sediment movement between the points (white arrows, Figure 7).

BLUFF POINT STATE PARK AND COASTAL RESERVE

Bluff Point State Park and Coastal Reserve in Groton provides a nice example of an observation stemming from Arthur Bloom's 1967 report and map (Figure 2). The Connecticut coast is composed of whatever assortment of materials waves have to work with (Figure 8).

The beach, just east of Bluff Point (Figure 8, olive double arrow), is made up of boulders, cobbles and gravels that were left behind as waves winnowed out the finer matrix from the glacial till that once covered fairly solid bedrock (Photo, page 8). This type of bedrock tends to be submerged in-place (Figure 6).

Figure 9 shows how highly fractured, less resistant bedrock often retreats as a bluff, rather than being submerged in place like the more resistant Lands End Peninsula (Figure 6).

The sediment supply for the Bluff Point-Bushy Point Beach-Spit (Figure 10) is derived from wave action mobilizing the sands of the extensive glacial delta that fills the bedrock valley between Jupiter Point and Bluff Point (green shading, Figure 8), and is home to the Groton-New London Airport.

Similar to the armored shoreline of the Hammonasset-Ledyard Moraine (Figure 5, bottom), wave action attacking the Bushy Point moraine has winnowed out finer sediments that form its matrix, leaving behind a resilient boulder cobble armor (Figure 11).

As the agents of change gain more advantage in the battle to rearrange our coast, the changes they bring about tend to have greater negative impacts on coastal populations and infrastructure. That, in turn, spurs the strong human drive to "fix" things and restore beloved coastlines to "the way they used to be."

When considering measures aimed at "fixing" local coastal problems, it is very important to be keenly aware that not all beaches function in similar ways. Before replicating a "fix" simply because it worked elsewhere, project designers must gain a good understanding of the physical setting where the candidate project worked and determine its degree of compatibility with the physical setting where the prospective project is to be located.



Figure 8. Coastal types featured at Bluff Point State Park. Bushy Point and Pine Island, armored moraine segments (red); Bushy Point-Bluff Point Beach, barrier spit (light brown); glacial delta deposits between Jupiter and Bluff Points (green); Bluff Point fractured bedrock outcrop (dark brown star); boulder-cobble-gravel beach overlying solid bedrock (olive double arrow); Map credit: An annotated digital quadrangle excerpt from Stone, and others, 2005; Source: DEEP ECO Map Catalogue: https://cteco.uconn.edu/map_catalog.asp

Figure 9. A: Photo of the outcrop of fractured bedrock that retreats as a bluff on the west side of Bluff Point (dark brown star, Figure 8). The fractures visible in the photo allow water to penetrate the rock and break it up through freeze-thaw cycles. B: A more solid type of bedrock, that tends to be submerged in place, is exposed at the base of the bluff. Photos: Ralph Lewis

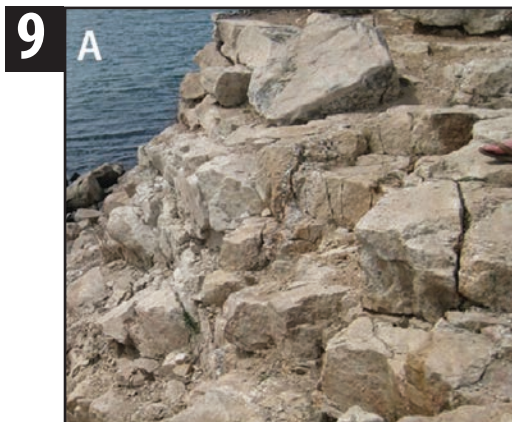
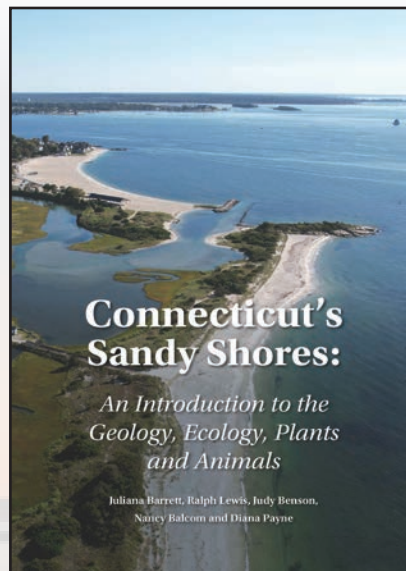


Figure 10. Looking north across the sandy Bushy Point Beach Spit to the glacial delta surface that the Groton-New London Airport was constructed on. Photo: CT DEEP



Figure 11. A view from Avery Point looking east at the armored "Bushy Point" moraine segment that forms Pine Island. Photo: Ralph Lewis

Connecticut's Sandy Shores: An Introduction to the Geology, Ecology, Plants and Animals can be purchased for \$18 plus shipping from Connecticut Sea Grant by sending a request to: michelle.marcaurele@uconn.edu



WHEN MARINE SCIENCE COMES ALIVE, TEACHERS BECOME STUDENTS AND STUDENTS BECOME TEACHERS



Story and photos by Judy Benson

Some of the best teachers share attributes with zookeepers. This isn't a sarcastic one-liner, meant to evoke the image of a classroom of unruly human animals. Quite the contrary.

Educators with some of the same passion for wildlife and nature that motivates others to pursue a career at the zoo often lead classrooms of some of the most engaged learners. Just ask Riley O'Hara, Peter Demasi and Ryan Jouanno, students in Eva Bartush's advanced marine science class at Brien McMahon High School in Norwalk.

"These guys were one and two inches long when I was a freshman," said O'Hara, peering into a tank of six-inch green spotted puffer fish, part of the extensive aquarium in Bartush's classroom. "I've watched them grow up."

A few tanks away, Demasi leaned over another tank with local marine life. A well-known Long Island Sound species lay on the bottom, nearly camouflaged in the sand.

"The evolution of that fluke is so cool," he said. "They evolved to have both of their eyes on one side of their face."

Most of the 14 seniors in the class were looking toward future marine-, ecology- or environment-related careers, as oceanographers, marine engineers, with the Coast Guard or Navy. The classroom aquarium, which includes freshwater, tropical marine and local marine species as well as a hydroponics garden fed by nutrient-rich wastewater from a large goldfish tank, is the keystone of a four-year marine science program at the school that began in 2018.

"This used to be a garage for auto mechanics classes," Bartush explained. "We got a grant that paid for half the cost of creating this, and the city put in the other half. It opened in 2019, then we had to shut down for two years during COVID."

"The tough part of this is keeping it going on holidays,



Previous page: Brien McMahon High School students Riley O'Hara, left, and Peter Demasi check on fish recently placed in tanks as the "giant fish hotel" of the classroom aquarium.

Left: A puffer fish swims along the bottom of one of the tanks for Long Island Sound species.

weekends and in the summer," she continued. "But the kids maintain it all."

McMahon High isn't the only school in the state with an aquarium, and there are three high schools in the state with a marine focus—the Sound School in New Haven, the Bridgeport Regional Vocational Aquaculture School and the Marine Science High School of Southeastern Connecticut in Groton. But Bartush isn't content just being a high school teacher with an aquarium. Instead, she wants to take what she's learned over 31 years of teaching to inspire other teachers to follow her example not just in the classroom, but in hands-on learning experiences on Long Island Sound.

"Sherwood Island is a great environment for field lessons," she told a group of teachers in a teacher development workshop last summer, after handing out "goodie bags" filled with lesson plans, salinity testers, minnow traps, plankton nets and other equipment to use with their students. "It's sandy on one side, on another side there's a salt marsh, and there's rocky shore and a wooded area. You can walk the entire island shoreline below high tide and do beach sampling, lessons about water quality and food webs, have a beach scavenger hunt."

Her introduction to Sherwood Island, a preserve in Norwalk Harbor, came just before the group boarded a boat to spend several hours there learning how to use the environment as an outdoor school. The program was offered through the Long Island Sound Mentor Teacher program, run by Connecticut Sea Grant with support from the Long Island Sound Study, to train educators in experiential and classroom lessons about Long Island Sound that are aligned with the Next Generation Science Standards. These are the science content expectations that guide curriculum in kindergarten through 12th grade in Connecticut and many other states.

"I created the Long Island Sound Mentor Teacher program in 2002 to fill a gap in

what was then the Connecticut Science Standards," recalled Diana Payne, education coordinator at Connecticut Sea Grant. "There was almost nothing on biodiversity, ecology, the environment—and only one mention of Long Island Sound in the 6th grade. A great way to fill the gap was to encourage teachers who already incorporate Long Island Sound into their curriculum to show other teachers how to do it. Our Mentor Teachers are outstanding. Many have also added multiple subject areas, including language arts, social studies, and art."

Once the boat reached Sherwood Island, Bartush began by showing the teachers how to use a refractometer to measure salinity, and a plankton net, a small, handled device. Depending on the mesh size of the net, she explained, the yield could include crab larvae, fish larvae, diatoms, zooplankton and copepods that could be seen under a microscope.

Next came the seine net. Orders of magnitude larger than the plankton net, it requires two people to wade into the water dragging the net toward shore. After a few tries James Longcoy and Kate McDonald, middle school science teachers in Norwalk, had a successful haul.



Participants in the Long Island Sound Mentor Teacher workshop arrive on the dock at Sheffield Island on July 28.



Students in Eva Bartush's marine science class work on posters about plastic pollution to display at the Discover Boats Norwalk Boat Show.

Below, from top: Teachers at the Long Island Sound Mentor Teacher workshop explore tide pools at Sheffield Island; Students in Eva Bartush's marine science class feed scup in one of the classroom tanks; and teachers at the workshop learn how to use a salinity tester.

"That was a great little seine," Bartush said, as she examined the Atlantic silversides, grass shrimp and other creatures from the net. "One lesson you can do is to have the students do the seining at locations farther and closer to the dock and do a comparison of the diversity. There's so much data collection you can do."

Then she led them to a rocky area to explore different types of seaweed and look for creatures hiding underneath, and then the tide pools between the rocks.

"Have the kids come out and just walk and explore and they're going to find all kinds of stuff," Bartush said.

In mid-September, a few weeks into the school year, Longcoy reflected on how he's using what he learned in the workshop in his classroom.

"I've shared my experiences with the kids, mostly with my seventh graders in lessons about ecosystems and biodiversity," he said. "We talk about the ecosystem and how fragile it can be and how important it is to preserve it for our quality of life on this planet."

A teacher for 34 years, Longcoy said the workshop rekindled his passion about teaching students about the local environment. He'd like to lead students on a trip to Sherwood Island one day.



"That workshop was an amazing experience," he said. "I'm all about experiential education."

Back in Bartush's classroom, the same pay-it-forward ethic was guiding students in an assignment. At the upcoming Discover Boating Norwalk Boat Show, the students would be manning a touch tank for young visitors. It would be filled with creatures collected at Sherwood Island. The students were to choose one, identify and write up some facts to teach children about their animal. Jouanno and his two partners chose a green crab.

"I'm a huge fan of green crabs," he said, smiling as he held one between his thumb and pointer finger.

The students will also be setting up an aquarium in the classroom of a nearby elementary school, and leading marine science lessons at another.

"Our kids teach their kids," Bartush said.



Editor's note: Diana Payne, Connecticut Sea Grant education coordinator since 1999, has been prominent in national and international efforts to advance ocean literacy as a fundamental educational concept that should be taught worldwide. As a leader in this area, she was recognized in 2021 with the National Marine Educators Association President's Award, and in May 2023 was among 20 people chosen by the United Nations Education, Science and Cultural Organization (UNESCO) for the Global Group of Experts on Ocean Literacy. In this article, Payne describes the origins, goals and achievements of the Ocean Literacy Campaign.

Campaign for ocean literacy works to bring marine education into classrooms and beyond



HOW INAPPROPRIATE TO CALL THIS PLANET EARTH, WHEN IT IS QUITE CLEARLY OCEAN.

—Sir Arthur C. Clarke



By Diana Payne
Photos courtesy of the National Marine Educators Association

The ocean. A vast watery highway covering more than 70% of Earth. It connects us. It makes Earth a place for life to exist. It plays a significant role in weather and climate. It is the defining feature of our planet. All life, including our own, exists because of the ocean.

But few of us learned much, if anything, about the ocean unless we chose to do so in specialized high school courses or in college. More than two decades ago, a group of passionate scientists and educators—myself among them—sought to change that.

The roots of what we now call the Ocean Literacy Campaign can be traced back to a few pivotal events.

An in-person workshop in May 2000, sponsored by the National Science Foundation (NSF), established the Centers for Ocean Sciences Education Excellence (COSEE). This was soon followed by reports from the Pew Oceans Commission in 2003 and the U.S. Commission on Ocean Policy in 2004. The reports noted that Americans knew very little about the ocean. Additionally, educators including me knew ocean science content was not part of what was then called the National Science Education Standards. We also knew that few ocean scientists were involved in education and outreach.

In the same time frame, other critical events occurred. In 2002, the National Geographic Society and the College of Exploration collaborated on the Ocean for Life program, which provided a model for convening a community of educators, scientists and others concerned about the public's lack of knowledge of the role of the ocean in their daily lives. The 2004 U.S. Commission on Ocean Policy report specifically called for increased ocean education as a critical component of ocean policy moving forward, specifically recognizing COSEE and the National Sea Grant College Program as “ocean education programs of particular importance.”

The report also recognized the National Marine Educators Association (NMEA) and the National Science Teachers Association (NSTA) as “professional organizations that could build a collaborative ocean education network.” The first seven COSEE centers and a national coordinating office were established in 2002, with three more centers added in 2004. Most centers included a Sea Grant partner and NMEA members. Also in 2004, the National Oceanic and Atmospheric Administration (NOAA), COSEE, the National Geographic Society, NMEA, the College of Exploration, and the Lawrence Hall of Science at the University of California



Connecticut Sea Grant Education Coordinator Diana Payne, third from left, gathers with other participants at a recent UN Educational, Scientific and Cultural Organization (UNESCO) meeting in Venice, Italy. Photo courtesy of Diana Payne

The Essential Principles of Ocean Literacy

- 1 Earth has one big ocean with many features.
- 2 The ocean and life in the ocean shape the features of Earth.
- 3 The ocean is a major influence on weather and climate.
- 4 The ocean makes Earth habitable.
- 5 The ocean supports a great diversity of life and ecosystems.
- 6 The ocean and humans are inextricably interconnected.
- 7 The ocean is largely unexplored.

Note: the use of the word “ocean” in Principle 1 in the singular. This is because there really is only one global ocean with several ocean basins



Berkeley convened a series of meetings to define the most important ideas people should understand about the ocean. These organizations provided the backbone support and leadership to ensure the process was as inclusive and transparent as possible, and that no one organization had or even today has ownership. The result was the seven Essential Principles and 44 (now 45) Fundamental Concepts.

In addition to the Essential Principles and Fundamental Concepts, a consensus definition of ocean literacy was created: ocean literacy is an understanding of the ocean’s influence on you and your influence on the ocean. The definition has three parts, because understanding alone does not make a person ocean literate. You must also be able to talk about the ocean with others in a meaningful way and apply what you know to making responsible decisions about the ocean and its resources.

Soon an *Ocean Literacy Guide* was created and released. Those who worked on it knew more resources needed to be developed. What is now known as the Ocean Literacy Framework came next, made up of four parts.

“Ocean literacy is an understanding of the ocean’s influence on you and your influence on the ocean.”

In addition to the *Ocean Literacy Guide*, which included definitions, essential principles and fundamental concepts, we developed a scope and sequence framework of how to conceptually build ocean learning through the grades. It was aligned with the Ocean Literacy Essential Principles and Fundamental Concepts and NGSS Disciplinary Core Ideas (the content), and the International Ocean Literacy Survey (IOLS), and translated into 17 languages. Each part of the framework was developed through collaboration, cooperation and transparency.

The newest resource is *A Handbook for*

*“Each of us has a part
to play in helping to
foster global ocean
literacy within our
own communities and
regions.”*



A fisherman tosses a net in the waters of the South Pacific.

Increasing Ocean Literacy. This handbook updates some of the articles and tools in NMEA's *Special Report on Ocean Literacy* (now out of print) and integrated other resources developed since 2010 (e.g., the NGSS alignments). An accessible version is now available on the NMEA website. This version enables those with a visual impairment to also access the framework documents.

While we did not intend to be a model for other disciplines, within a year of the first guide being published we saw an effort launched to create a climate literacy document. Since then, the *Ocean Literacy Guide* has influenced other groups, resulting in numerous publications. Each guide includes a definition of the topic, and a small number of big ideas, supported by smaller, underlying concepts. These topics include atmospheric science, climate, Earth science, energy, estuaries, Great Lakes, Lake Erie, neurosciences, and Mediterranean Sea literacy.

The actions that became the Ocean Literacy Campaign addressed specific challenges in the United States, including a lack of ocean science content in the education system. Ocean literacy has also become a global phenomenon. Not only have there been numerous adaptations and translations of the original *Ocean Literacy Guide* into other cultures and languages, the seven Essential Principles have influenced curricula, exhibit design and common messaging and communications internationally.

In large part through international participation at NMEA conferences and collegial connections, multiple marine education organizations have developed

with a focus on ocean literacy in various regions, including the International Pacific Marine Educators Network—IPMEN (Maui 2005), European Marine Science Educators Association—EMSEA (Boston 2011), Asia Marine Educators Association—AMEA (Rhode Island 2015), CaNOE—the Canadian Network for Ocean Education—(2015) and RELATO—Latin American Education Network for the Ocean (Latin America and the Caribbean) (2019).

More recently, global efforts have begun to co-create and co-develop programs and projects to increase global ocean literacy. In 2017, UNESCO released *Ocean Literacy for All: A toolkit*. The publication connects the Ocean Literacy Essential Principles and Fundamental Concepts with UN Sustainable Development Goal No. 14: “Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.” It also includes vignettes featuring perspectives of scientists on the importance of a global population that is ocean literate. The document also shares success stories and several activities aligned to Ocean Literacy Principles and UNESCO Sustainable Development goals.

The United Nations Decade of Ocean Science for Sustainable Development (Ocean Decade), led by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, kicked off in January 2021. While the main focus is on scientific data collection and advancing ocean technology, ocean literacy is also a key component of Ocean Decade activities and includes a specific program—Ocean Literacy With All (OLWA). OLWA goals include: advancing ocean literacy through international partnerships and networks; designing and implementing

transformative locally and globally relevant education and research-based activities and projects by and for diverse stakeholders; and aiming toward capacity and behavior change to achieve an ocean literate society to help ensure sustainable development of the global ocean.

In May 2023, the IOC assembled a Group of Experts on Ocean Literacy. The Group of Experts will provide guidance in the scoping, implementation and monitoring of IOC/UNESCO ocean literacy activities.

“Ocean literacy is a fundamental tool to advance ocean sustainability” said Francesca Santoro, senior programme officer for ocean literacy at the IOC-UNESCO Secretariat. “The IOC/UNESCO is becoming a leading force in promoting ocean literacy across different regions and countries. We look forward to working with the Group of Experts to bring their diverse expertise together with different perspectives and approaches.”

Ocean literacy is critical to the success of the Ocean Decade and particularly Challenge 10: *Change humanity's relationship with the ocean*. Each of us has a part to play in helping to foster global ocean literacy within our own communities and regions.

RESOURCES:

Ocean literacy overview: <https://www.marine-ed.org/ocean-literacy/overview>

Ocean Literacy Essential Principles and Fundamental Concepts: https://static1.squarespace.com/static/5b4cecfde2ccd188cfed8026/t/60b90193ec346816a95717bb/1622737304272/OceanLiteracy_ENG_V3.1_2021.pdf

Ocean Literacy Scope and Sequence for Grades K-12: <https://www.marine-ed.org/ocean-literacy/scope-and-sequence>

Ocean literacy alignment with NGSS: <https://www.marine-ed.org/ocean-literacy/ngss-alignment>

A Handbook for Increasing Ocean Literacy: <https://www.marine-ed.org/ocean-literacy/handbook>



Ocean identity research examines how and why the ocean shapes our sense of self

By Miriah Russo Kelly

Ocean identity is an abstract idea.

An abstract idea can be difficult to understand if it's outside your area of expertise. Nonetheless, ocean identity is worth the effort, because it's a concept that could be valuable in trying to build a sustainable future.

As a researcher on ocean identity, I want people to know not only what the term means, but also, why it matters for shaping the future of our engagements with ocean and coastal stakeholders.

Ocean identity isn't a new concept, but it's not yet widely understood. A simple definition, used in a forthcoming journal article I authored with other researchers, is that ocean identity is the connection between an individual's self-concept and ocean spaces. Our research is expanding the concept of ocean identity by looking into not just what ocean identity is, but also why one has the ocean identity they do.

On a personal level, my own ocean identity was formed by growing up in Connecticut and having many adventures along the shorelines of the northeast throughout my formative years. I also had an incredibly impactful experience while studying abroad in Spain during my undergraduate education when I was travelling in a coastal region that had just experienced a massive oil spill. Seeing the impact of that event reshaped my educational goals. It changed how I thought about my role in helping the environment, and is something that still shapes my ocean identity today.

Our research complements work being done by marine educators worldwide to advance ocean literacy, which promotes lessons and curriculum about how people influence the ocean and how they are influenced by it. But there is an important difference between the two. Ocean literacy focuses on the physical properties of the relationship—how the ocean impacts our weather and how human consumption is changing ocean chemistry, for example. Ocean identity deals with the



Miriah Russo Kelly speaks about her ocean identity research to an audience at the UN Climate Change Conference in Sharm El-Sheikh, Egypt, in November 2022. Photo courtesy of Miriah Russo Kelly

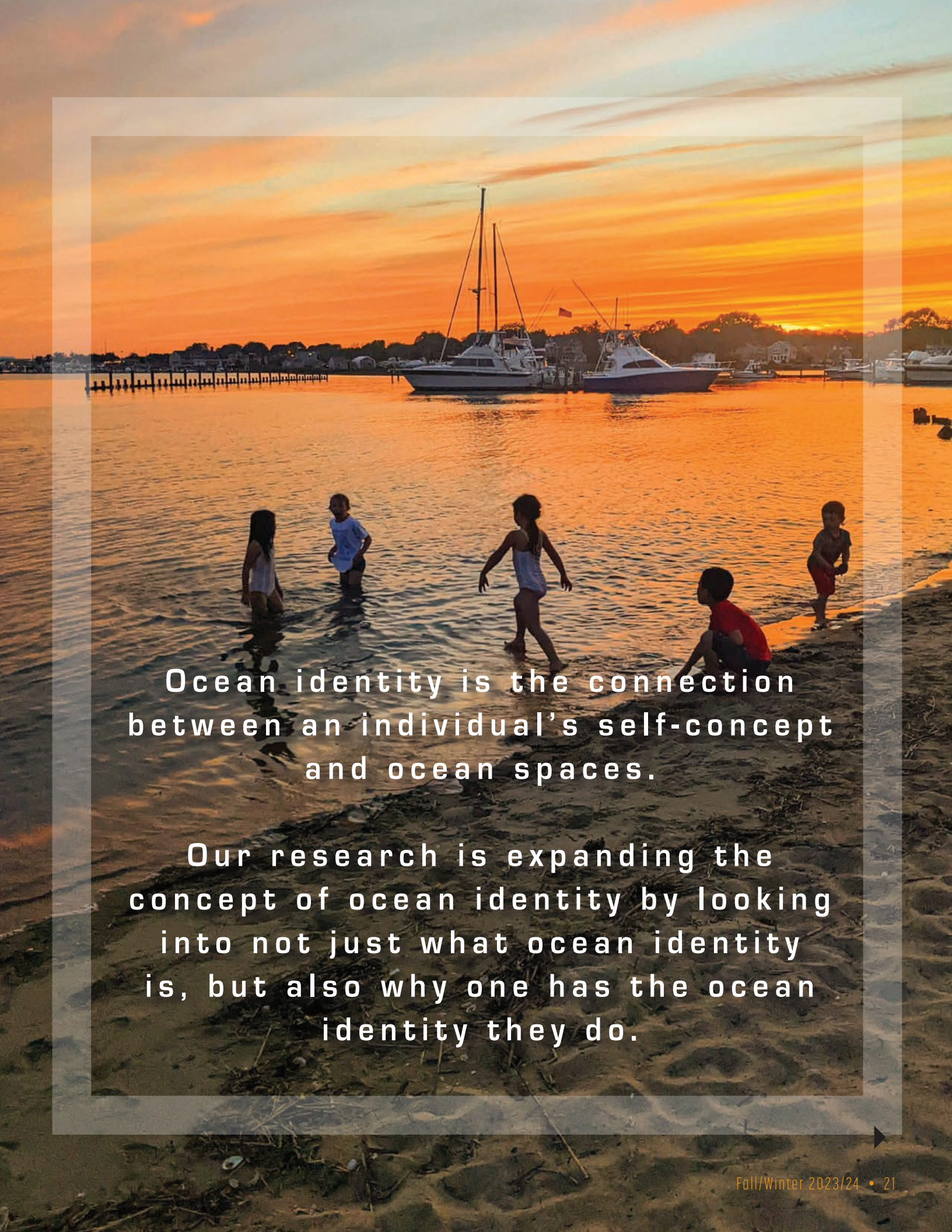
psychological realm, our sense of self in relation to the ocean.

Six years ago, our research team of Jamie Vaudrey from the University of Connecticut, Jo-Marie Kasinak and the late Jen Mattei from Sacred Heart University, Emma McKinley from Cardiff University, and me from Southern Connecticut State University started to develop our ideas around the concept of ocean identity.

Since then, we have seen the United Nations Decade for Ocean Science, a growing emphasis on ocean spaces in the UN Framework Convention on Climate Change, and the signing of the High Seas Treaty. With this increased focus on the ocean, we are dedicated to researching the multiple human, social and cultural aspects of coastal and marine environments, especially in the age of climate change.

In 2021, we were awarded funding from Connecticut Sea Grant to support the development of a conceptual framework, survey, and toolkit related to our ocean identity research. Over the past two years, our team worked closely with Sea Grant ocean education experts. We've consulted with a variety of coastal and ocean stakeholders interested in the topic, and we have shared our work broadly at local, national, and international conferences. In the Sea Grant spirit our project is deeply considerate of stakeholder thoughts and ideas, takes into consideration the best available research, and is positioned to have a positive impact on our communities here in Connecticut and beyond.

In our work, we seek to uncover the ways ocean spaces shape us as individuals. In the environmental and marine sciences, researchers think a lot about the human impact on environments and how people shape ocean and coastal areas. But our work is really about the reverse of that, because it is about understanding how ocean and coastal environments might be shaping how we think about ourselves.

A photograph of a sunset over a body of water. In the foreground, five children are playing in the shallow water near a sandy beach. In the middle ground, two large sailboats are anchored. The background shows a distant shoreline with houses and trees under a vibrant orange and yellow sky.

Ocean identity is the connection
between an individual's self-concept
and ocean spaces.

Our research is expanding the
concept of ocean identity by looking
into not just what ocean identity
is, but also why one has the ocean
identity they do.

There is a very strong research basis for the idea that identity drives behavior. So, if we really want to encourage positive environmental behavior such as ocean stewardship, we need to understand how our individual self-concepts are shaped by ocean and coastal areas. Ultimately this will lead to improvements in education, outreach and engagement, as it will inform the ways that strong ocean identity can be most effectively developed in people of all ages.

As part of our project, we are creating a survey that educators and practitioners can use to measure ocean identity in their programs. We will also be sharing an ocean identity toolkit so that others have what they need to measure ocean identity with efficiency. As a team, we've discussed the many different ways our research can be applied.

Our hope is that others will use the instrument we're developing to assess ocean identity in their context. Furthermore, we can use the instrument to build strong ocean identity across diverse audiences in our state and throughout the region. We look forward to a future where ocean and coastal researchers, professionals and enthusiasts from all over the state and region are using our ocean identity toolkit and telling us about it.

Our research team is unique in that it is truly an interdisciplinary group, from four different universities, and we are all women. As the lead researcher on this project, I appreciate that even though we each have our unique interests

in the concept of ocean identity and how we can apply it, we work collaboratively and enjoy learning from each other. Unfortunately, late in 2022 we lost a beloved member of our team, and our community. Professor Jen Mattei of Sacred Heart University and founder of Project Limulus was well known for her work in restoring coastal habitats and teaching anyone who would listen about the importance of the *Limulus* genus, commonly called horseshoe crabs. Her loss is felt deeply in our team though we still use her insights to inform our work.

We will be piloting our survey and toolkit with Project Limulus this summer and will learn from her program how to shape ocean identity tools for others.

In the end, we believe that it is imperative that we not just look at what ocean identity is, but why one comes to have a particular ocean identity. As scientists, we are very knowledgeable of the ways we as humans have impacted ocean spaces, and now is the time to more deeply consider ways ocean spaces impact *us*. Doing so will help us shape a more sustainable future by giving us the information we need to create education, outreach and engagement that positively impacts ocean identity.

EXAMPLES OF OCEAN IDENTITY CHARACTERISTICS:

- ▶ **Ocean belonging:** the extent to which individuals have a sense of belonging in ocean spaces or feel emotionally connected to ocean spaces
- ▶ **Ocean concern:** the level of concern one holds for ocean-related issues
- ▶ **Ocean personal expression:** level of regular expression of ocean affinity through art, fashion and design



EXAMPLES OF HOW OCEAN IDENTITY MIGHT BE INFLUENCED:

- ▶ Frequency of interaction with ocean spaces
- ▶ Type of ocean activities engaged in (boating, swimming, fishing and other types of water recreation)
- ▶ Perceived barriers to accessing ocean spaces





Authors, photographers and editors who contributed to the *Connecticut's Sandy Shores* guide recently published by Connecticut Sea Grant and the Connecticut College Arboretum take a celebratory walk along the wrack line at Waterford Town Beach in October. Judy Benson / Connecticut Sea Grant

What's in our names?

What are wrack lines? The word wrack is a term for various kinds of seaweed, and wrack lines are the collections of organic matter (sea grass, shells, feathers, seaweed and other debris) that are deposited on shore by high tides. More generally, wrack lines are where the sea meets the land.

With our magazine *Wrack Lines*, we tell stories about the intersection of the land, sea and Connecticut Sea Grant. So what is Connecticut Sea Grant? One of 34 Sea Grant programs across the country, it helps residents make the most of our coastal resources and inland waterways.

It addresses the challenges that come with living by the water or within the Long Island Sound watershed, in a state with 332 miles of shoreline and three major tidal rivers. This NOAA-state partnership based at UConn's Avery Point campus works with aquaculture farmers, fishermen and seafood purveyors to help their businesses prosper.

It funds research essential to understanding and managing our changing coastal and inland environments. It provides communities and local leaders with the information they need to make better land and shoreline decisions that result in more resilient communities and healthier watersheds. It educates students as well as teachers and adults of all ages about the marine environment.

Connected to experts and residents who live, work and recreate in the Sound and its watershed, it brings diverse interests together around a common purpose of working for mutually beneficial solutions to problems.

Small in staff but big in impact, Connecticut Sea Grant is like a pilot boat that navigates the way for large vessels toward safe harbors. Since 1988, Connecticut Sea Grant has supported "Science Serving the Connecticut Coast."



Don't miss an issue!

Wrack Lines is available online at: <https://seagrant.uconn.edu/publications/wrack-lines/>

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TALK TO US

Send comments and questions about this issue to:
judy.benson@uconn.edu

We'll share as many as possible, along with our responses, at:
seagrant.uconn.edu

Don Bell, who leads tours for Copps Island Oysters in Norwalk, shows a horseshoe crab to teachers at the Long Island Sound Mentor Teacher Workshop in July. Judy Benson / Connecticut Sea Grant



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Students and volunteers in the "Messing About in Boats" event on Sept. 15 row off the shores of UConn Avery Point in the afternoon, in calmer waters than in the morning. Judy Benson / Connecticut Sea Grant

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