

DRIFTING PLANTS KNOWN  
AS SARGASSUM SUPPORT  
A COMPLEX AND AMAZING  
VARIETY OF MARINE LIFE.

## The Weed That Feeds the North Atlantic

BY JAMES PROSEK

PHOTOGRAPHS BY DAVID DOUBILET  
AND DAVID LIITTSCHWAGER



Hatchling sea turtles, like this juvenile loggerhead, make their way from the sandy beaches where they were born toward mats of sargassum weed, finding food and refuge from predators during their first years of life.

**PREVIOUS PHOTO**

A clump of sargassum weed the size of a soccer ball drifts near Bermuda in the slow swirl of the Sargasso Sea, part of the North Atlantic gyre. A weed mass this small may shelter thousands of organisms, from larval fish to seahorses.

DAVID DOUBILET (BOTH)

**‘There’s nothing like it in any other ocean,’ says marine biologist Brian Lapointe. ‘There’s nowhere else on our blue planet that supports such diversity in the middle of the ocean—and it’s because of the weed.’**

LAPOINTE IS TALKING about a floating seaweed known as sargassum in a region of the Atlantic called the Sargasso Sea. The boundaries of this sea are vague, defined not by landmasses but by five major currents that swirl in a clockwise embrace around Bermuda. Far from any mainland, its waters are nutrient poor and therefore exceptionally clear and stunningly blue.

The Sargasso Sea, part of the vast whirlpool known as the North Atlantic gyre, often has been described as an oceanic desert—and it would appear to be, if it weren’t for the floating mats of sargassum.

The seaweed may seem unremarkable at first glance—just bunches of drifting plant matter—but as Lapointe has helped illuminate through his work, sargassum is the basis of a complex ecosystem that nurtures a stunning array of marine life. It serves as a mobile shelter and a movable feast.

For 36 years Lapointe, a biologist with Florida Atlantic University’s Harbor Branch Oceanographic Institute in Fort Pierce, has combed the Sargasso Sea, observing sargassum by satellite and experiencing it firsthand in scuba gear. He wanted to figure out where the weed comes



A sperm whale swims beneath golden sargassum. The weed nurtures countless life-forms, from single-celled organisms to the largest mammals. Excrement from these creatures helps extend the weed’s life.

BRIAN SKERRY

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from, how it moves, what it sustains, and what sustains it—and to unravel the complex relationship sargassum has with other forms of marine life, from seahorses to great white sharks. Only by learning about this vital resource, he says, can we protect it from potential threats, such as ocean acidification and pollution.

When it needs protecting, that is.

During the past few years, sargassum has been making the news not as life-giving manna but as a scourge, mounds of it fouling beaches in the Caribbean and Mexico. No one's talking about protecting sargassum anymore, Lapointe says. "It's more like, how do we get it to go away?"

The sailors aboard Christopher Columbus's *Santa María* were of like mind. The weed in some places was "so thick that it actually held back the ships," reads a September 20, 1492, entry in the ship's log. Early explorers noted that the air bladders keeping the seaweed afloat reminded them of a grape they called *salgazo*.

Sargassum originates in nutrient-rich zones close to the coast of the Americas, particularly in the Gulf of Mexico. Currents carry it around the Florida Peninsula, where it's taken up by the northward-flowing Gulf Stream and eventually ends up in the Sargasso Sea.

Oceanographer Sylvia Earle, who helped initiate an effort to make the Sargasso Sea the first high seas marine protected area, likens sargassum to a golden rainforest (see her essay, page 140). It's an apt metaphor, because the weed forms a kind of canopy at the ocean surface.



Small gas-filled bladders called pneumatocysts keep sargassum buoyant and close to the surface, providing a raft for this sargassum shrimp, whose color resembles the weed that hosts it.

DAVID LIITTSCHWAGER



RILEY D. CHAMPINE, NGM STAFF  
SOURCE: BRIAN LAPOINTE, FLORIDA ATLANTIC UNIVERSITY

Sargassum brings to my mind a floating reef or even a marine grassland—a Serengeti of the sea.

Its tangled tresses support an astonishing diversity of organisms that hide in and feed off the weed—the larvae and juveniles, according to one study, of 122 different species of fish, as well as hatchling sea turtles, nudibranchs, seahorses, crabs, shrimps, and snails. The seaweed in turn is nourished by the excrement of these organisms.

Larger creatures such as fish and turtles find plenty to eat amid the sargassum, and they attract bigger predators—triggerfish, triple-tails, filefish, mahi-mahis, and jacks, on up the chain of life to sharks, tuna, wahoos, and billfish. Tropic birds, shearwaters, petrels, terns, boobies, and other birds of the open ocean roost and forage on sargassum mats.

The two predominant species of sargassum in the Sargasso Sea are the only seaweeds in the world that don't begin life attached to the seafloor. As a consequence of this life unmoored, the translucent gold- to amber-colored mats exist at the whim of the winds and currents, pulled apart in storms and reassembling in calmer seas, their edges locking together like Velcro. The weed masses vary in size from several miles long to pieces no bigger than your hand.

"Even those little clumps have organisms associated with them," says Jim Franks, a senior research scientist and sargassum expert with the University of Southern Mississippi's Gulf Coast Research Laboratory in Ocean Springs. The teeming life associated with sargassum must constantly adjust to the coming together and breaking apart of the nurturing islands.

# A sargassum menagerie

David Liittschwager photographed an abundance of animals in sargassum from the Gulf of Mexico and off Bermuda. Here's a sampling.

1. Sargassum fish
2. Common octopus
3. Glasseye snapper
4. Copepod
5. Sergeant major
6. Balloonfish
7. Sargassum nudibranch
8. Squirrelfish, juvenile
9. Balloonfish, juvenile
10. Dolphinfish, juvenile
11. Yellowtail damselfish
12. Mahi-mahi
13. Bearded flying fish
14. Shore crab

DAVID LIITTSCHWAGER  
(MAGNIFICATION VARIES)



Sargassum enmeshed in rope provides shade and shelter for triggerfish. Human-made debris, from shipping pallets to plastic crates and fuel canisters, can provide a drifting platform on which life can grow but can also harbor harmful invasive species.

DAVID DOUBILET



Sargassum, Franks says, “is one of the most dynamic marine habitats imaginable.”

THE SARGASSO SEA has long been associated with mystery. Eighteenth-century sailors referred to this part of the Atlantic as the horse latitudes because, the story goes, ships would get becalmed there and have to dump their horses overboard as freshwater supplies dwindled. And the Sargasso overlaps with the mythic region known as the Bermuda Triangle, where ships and planes are said to have disappeared without a trace. Whether or not you buy into the legends, when you’re out on the Sargasso Sea, you can’t help but be touched by moments of the sublime.

One night underwater off Bermuda, photographer David Doubilet was taking pictures of fish attracted to a floodlight on our boat. He circled

several flying fish when a large tiger shark was spotted at the periphery of the light. Doubilet was hauled out by his safety line in a hurry.

On repeated outings, we scouted for large mats of sargassum to explore. It was nowhere to be seen. “One day you won’t see any at all,” an old fisherman told us, “then you wake up the next morning, and the bays and harbors are choked with it.”

On other days we had better luck, netting clumps of sargassum and sorting through them in buckets, looking for marine life for photographer David Liittschwager to document. Turning one piece over, I spotted a froggy little creature with a big mouth and weedlike appendages: the sargassum fish, one of more than a dozen organisms that evolved to mimic the seaweed. Using its tiny pectoral fins to cling to the sargassum,

it was all but invisible. Philippe Rouja, a Bermudian marine biologist who was helping us look for creatures living in the weed, dropped another little fish into the bucket. The sargassum fish immediately gulped it down in its large mouth.

That night, I sat with Liittschwager as he photographed the day’s bounty. In one soccer-ball-size clump of sargassum, we counted 900 tiny fish larvae, 30 amphipods, 50 snails, four anemones, two flatworms, six crabs, 20 shrimps, seven nudibranchs, more than a thousand calcifying worms, and abundant bryozoans, diminutive copepods, and other planktonic animals almost too numerous to count.

“So,” an astonished Liittschwager said after we’d completed the inventory, “the conservative count is 3,000 creatures visible to the naked eye—well, with my reading glasses.”

LAPOINTE’S EFFORTS to promote sargassum’s virtues to a wider public have been derailed by the weed’s explosions in the Gulf, the Caribbean, Brazil, and even West Africa, smothering mangrove habitats, suffocating reefs, choking bays, burying beaches (the mats prevent hatchling turtles from making their way to the open sea), and hurting tourism.

“Too much of a good thing,” Lapointe says of the weed blooms—making the water “anoxic and putrid.”

During the past several years sargassum washed up on beaches on Martinique and Guadeloupe in piles more than 10 feet high. “I’ve got people telling me if this doesn’t stop, we’re going to have to shut down our resorts,” Lapointe says. People on Trinidad and other Caribbean islands have been forced to evacuate their homes because of the toxic hydrogen sulfide gas released by the rotting weed on beaches.

No one knows exactly why these blooms happen. Lapointe thinks climate change may be altering ocean currents, carrying sargassum to places it’s rarely been seen—from West Africa to the northern coast of Brazil. Another hypothesis is that phosphorus-rich wind-borne dust from the Sahara that used to be blown across the Atlantic has been settling out at sea, triggering offshore blooms. But the main culprit is likely nitrogen enrichment from industrial farming in the U.S. interior—nutrients flowing from the Mississippi system into the Gulf, causing sargassum to grow rampantly.

“The system is too complex to fully understand,” Lapointe said, “but this is what seems to be happening. We’re tracking down the nitrogen trail, and it starts in the heartlands.”

I need look no farther than out my window in southern Connecticut to be reminded that interconnectedness in nature is not just a New Age platitude borrowed from Eastern philosophy. No creature better exemplifies the holism of nature than freshwater eels. They live in the pond across the street from my house, but guess where they—and every other American eel—were born? In a warm womb a few thousand miles away called the Sargasso Sea. □

Artist and writer **James Prosek** is working on a book about ways of naming and ordering the natural world. **David Doubilet** has photographed more than 70 *National Geographic* stories. **David Liittschwager**’s photographs of plankton and plastic appeared in May 2019.

# The Sargasso Sea— a Living Laboratory for Change

By **Sylvia A. Earle**

I CAN ALMOST FEEL the sizzle of energy as sunlight, carbon dioxide, and water work the magic of photosynthesis while I drift, wrapped in a golden curtain of sargassum, just off Bermuda. I revel in the sensation and am thrilled to see tiny bubbles of oxygen, a by-product of photosynthesis, rise to the surface and join the oxygen produced by trillions of diatoms, blue-green bacteria, and other phytoplankton in the surrounding ultraclear water.

As a living laboratory, the Sargasso Sea—with its masses of sargassum and their cargoes of lilliputian creatures—has yielded important findings about how and why the ocean matters to everyone, everywhere, all the time.

It was in 1988 that *Prochlorococcus*—Earth's smallest and most numerous photosynthetic organisms—were discovered in the Sargasso. Now known to occur globally, they churn out as much as 20 percent of the oxygen in the atmosphere. Seaweed and microscopic organisms provide oxygen for life in the sea and more than half the oxygen in the air we breathe. The carbon dioxide they capture is transformed with water into sugar, helping to fuel the complex ocean food webs that culminate in tuna, sharks, whales—and us.

Zoologist William Beebe and engineer Otis Barton, diving in a small submersible in the Sargasso Sea near Bermuda during the 1930s, observed life-forms that exist as much as half a mile deep by day and swim toward the surface at night to feed on phytoplankton, drifting seaweed—and one another. These migrating hordes of small fish and invertebrates, the largest concentrations of animals on Earth, now figure prominently in climate science as “blue carbon”—carbon dioxide captured in the tissues of creatures smaller than the dots on this page and as large as blue whales.

On land, forests also sequester the carbon dioxide that contributes to the planet's warming, but terrestrial environments occupy far less space than the living ocean. In the Sargasso Sea, at least 14 major groups of animals live on or swim among the floating forests of seaweed. Near Bermuda, biologist Laurence Madin has found that many in a single haul of plankton.

For decades, currents in the Sargasso Sea have been assessed, its temperature and water chemistry measured, and its migrating wildlife

documented. The findings have shed light on the oceans' role in governing climate and weather, and the processes that underpin our existence.

The Sargasso also bears evidence of harsh human impacts that are occurring globally, from waste dumping to illegal, unreported, and unregulated fishing. In 2010 a coalition working with the Bermuda government formed the Sargasso Sea Alliance, replaced in 2014 by the Sargasso Sea Commission. Our mission: to protect the Sargasso Sea, using it as a model for what can be done regionally, while the UN seeks to protect the ocean globally. □

Oceanographer **Sylvia Earle** is a National Geographic explorer-in-residence and co-chaired the Sargasso Sea Alliance steering committee. Founder of Mission Blue and Deep Ocean Exploration and Research, “Her Deepness” has served as chief scientist of NOAA and has logged thousands of hours of undersea exploration.



#### ABOVE

A school of jacks forage beneath translucent weed mats. Jules Verne, in his 1870 book *Twenty Thousand Leagues Under the Sea*, likened sargassum to a “carpet of weeds.”

DAVID DOUBILET

#### LEFT

Sylvia Earle investigates a mat of sargassum off Bermuda during a 2010 expedition as part of her Mission Blue initiative to explore and protect the ocean. “The Sargasso,” Earle says, “shines with hope in a troubled ocean.”

SHAUL SCHWARZ, GETTY IMAGES

## WEB HEADLINE

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up to 140 characters

## SINGLES



A diver slips beneath a dense mat of sargassum. Some of the weed eventually sinks toward the seabed, where it continues to nurture life in the deep. DAVID DOUBILET

## SINGLES



A bearded flying fish is mirrored at the water's surface on a dark night in the Sargasso Sea. DAVID LIITTSCHWAGER



Fish congregate at night in the Sargasso Sea near Challenger Bank, a shoal off Bermuda. DAVID DOUBILET



# SINGLES



Tiny zooplankton populate a drop of water from the Sargasso Sea. DAVID LIITTSCHWAGER



These larvae will grow to become flying fish. DAVID LIITTSCHWAGER



