The primordial sea, and me

ESSAY BY PAUL VANDEVELDER

This glimpse into the basement of time is also a signal from the moon and the sun that they have lost their grip on the ocean.

Early one summer morning, while balanced on a knife-edge of basalt high above the churning surf at Yaquina Head on the Oregon coast, a familiar voice boomed out to me from the eddies of ground fog that swirled across the cobbled beach, far below.

"Yo, hey," hollered my guide, John Borowski, a marine sciences teacher. "You've gotta come see this!"

I had always viewed coastal tidal zones as a kind of evolutionary skid row, a waste bin for genetic castoffs and derelicts. Now, my comeuppance was at hand, literally and figuratively. After I scrambled down a treacherous path to the beach, John pointed at the golden-colored invertebrate in the well of his palm. "This little guy has a notochord as a larva, but he loses it when he becomes an adult," he explained. "I have the honor of introducing you to your distant cousin, Mr. Tunicate, better known as a sea squirt."

We had arrived at Yaquina Head at first light, followed by a stream of cars and mini-vans carrying scientists, painters, photographers, teachers and students from as far away as Nebraska and Colorado. This accidental parade was prompted by a phenomenon Borowski calls "a monster minus," a once-a-year tidal event that exposes — for a few precious minutes — exotic creatures from the basement of Earth time, a primordial world that is neither land nor sea. Here, in the intertidal zone where terra firma meets the ocean, the first ticks of biological time were measured in the gently throbbing ectoplasmic clock of our planet's first living cells.

Billions of years later, tidal flows controlled by the moon and sun are still the celestial royalty that rule here. Everybody eats, everybody has sex, everybody dies. Though I'd always thought of myself as a mountain person, coming back to the ocean is the return ticket on a round-trip journey that began eons before my birth. I'm nine-tenths water, and every drop of me evaporated from this water and was carried inland on a cloud. Through myriad hydrologic processes, each drop found its way to me. And you.

For all but a few hours of the year, this primordial soup kitchen is fiercely hostile to hominids in sneakers. Yet for 500 million years, the creatures that live here have never had a day off! That's because the intertidal zone is the great seaside takeout window on which all of the earth's pelagic species depend. Every spawning sea star, for example, releases several million eggs. A few will ripen into adults, but the remaining millions — wave after wave of protein and lipids — will feed dozens of hungry species waiting for lunch in deeper water. Marine zoologists estimate that 90 percent of the world's oceans are biological deserts. The remaining 10 percent are home to 90 percent of all living creatures. The intertidal zone is their front porch.

"What's fascinating is the zonation you see between these species on these big minus tides," explains Borowski. "Competition for space is intense. If you live in one of the zones, you have to take care of your next-door neighbor because she's probably your next meal."

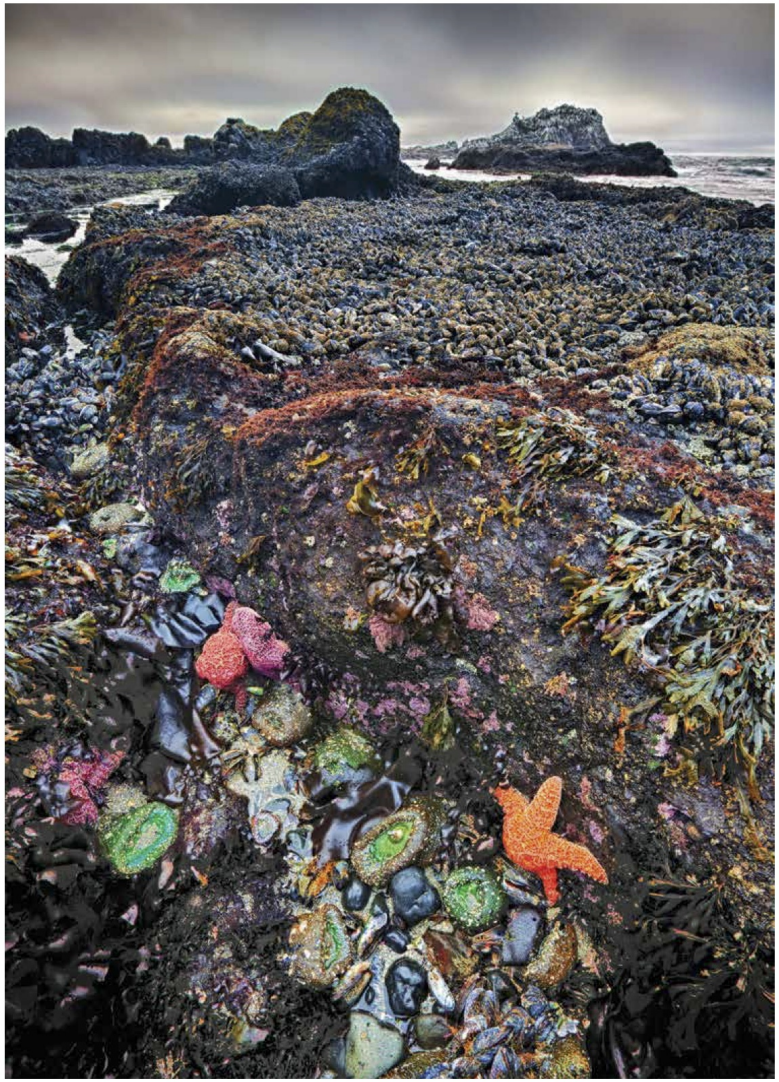
The exotic creatures that live here have developed specializations that enable them to travel between zones. The hard-shelled chiton (pronounced *ky-ton*) and soft-shelled crab, for example, have rigid exoskeletons that protect them from drying out when the receding tide exposes them to wind and sun. Creatures in the deeper zones, such as anemones and sponges, have flexible bodies that absorb the ceaseless pounding of waves. Sea stars, the alpha predator of the deeper (laminaria) zones, always go out to dinner. The keystone species in their restaurant of choice is the tidal zone's most prolific progenitor, the common mussel. A healthy community of mussels will support 7,000 individual members per square meter. "Every one of these little guys," says Borowski, "filters microbic proteins from 7.5 liters of seawater, per hour. That's 14,000 gallons of filtered water per hour, for one tiny community of mussels. Now, multiply that by a couple of hundred million years."

Those kinds of numbers give me vertigo, but the intertidal zone is a great deal more than a smorgasbord of protein and bivalve filtration. It is also the testing ground for species, the giant mixing bowl of life in which precise adaptation to the fierce press of elements has been the indispensable ingredient for survival for hundreds of millions of years. "Relatives of every major group of invertebrates on the planet can be found in a single tide pool on this coast," says Borowski, as he hovers over a community of bright pink cnidaria, or anemones. "It's all here. We know where life started."

As Rachel Carson explained in her book *The Edge of the Sea*, the only sounds on our planet during the Precambrian Era were those of wind against rock, water against sand, and volcanic eruptions. In that prepossessing silence, the building blocks of life as we know them — hydrogen, oxygen, nitrogen — were coming together in the intertidal zones as continents took shape. Billions of years later, I marvel at the fact that the salinity of my blood, sweat and tears is precisely the same as the primordial soup sloshing about in these tidepools. Yet I also know that 54,000 miles of saltwater shoreline in the United States is under siege from a rogues' gallery of sinister threats; deforestation, shoreline developments, coastal erosion, oil spills, ocean acidification, and industrial and agricultural pollutants of every kind. Pesticides, herbicides and the ubiquitous nitrates in fertilizers lead the charge. Fortunately, the intertidal zones on this iconic Oregon shoreline have escaped most of the man-made perils, so when the sea pulls back her skirts on this rare day, she reveals a universe of spectacular beauty. Perched on a ledge that was under 20 feet of seawater just hours ago, I watch a tiny crab emerge from its rocky nook and take a look around. Its neighbors, a colony of green anemones, are closed like eyes against the wind and sunlight. As purple urchins and nudibranchs doze in the sun, we hominids scurry from one pocket universe to the next, the pages of our field guides fluttering in the breeze as we announce our discoveries with shrieks of amazement.

At tide's nadir, Borowski lets out a whoop from the edge of the laminaria zone. He has found what he came for, a rare sunflower star, the shyest member of the peripatetic echinoderms. If you are lucky enough to see one of these creatures, look quickly, because this glimpse into the basement of time is also a signal from the moon and the sun that they have lost their grip on the ocean. In minutes, the returning waves will slip from their ephemeral grasp and chase us back to the cobbled beach.

There, as the silence roars around us, we gather in little knots and gaze in wonder as the crucible of life disappears beneath the gossamer flux of the sea, leaving us high and dry. And breathless. Dusted with awe. □



Sea stars, mussels, tunicates and anemones are exposed for human eyes to see when the ocean tides sweep away.
CRAIG MCCORD

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