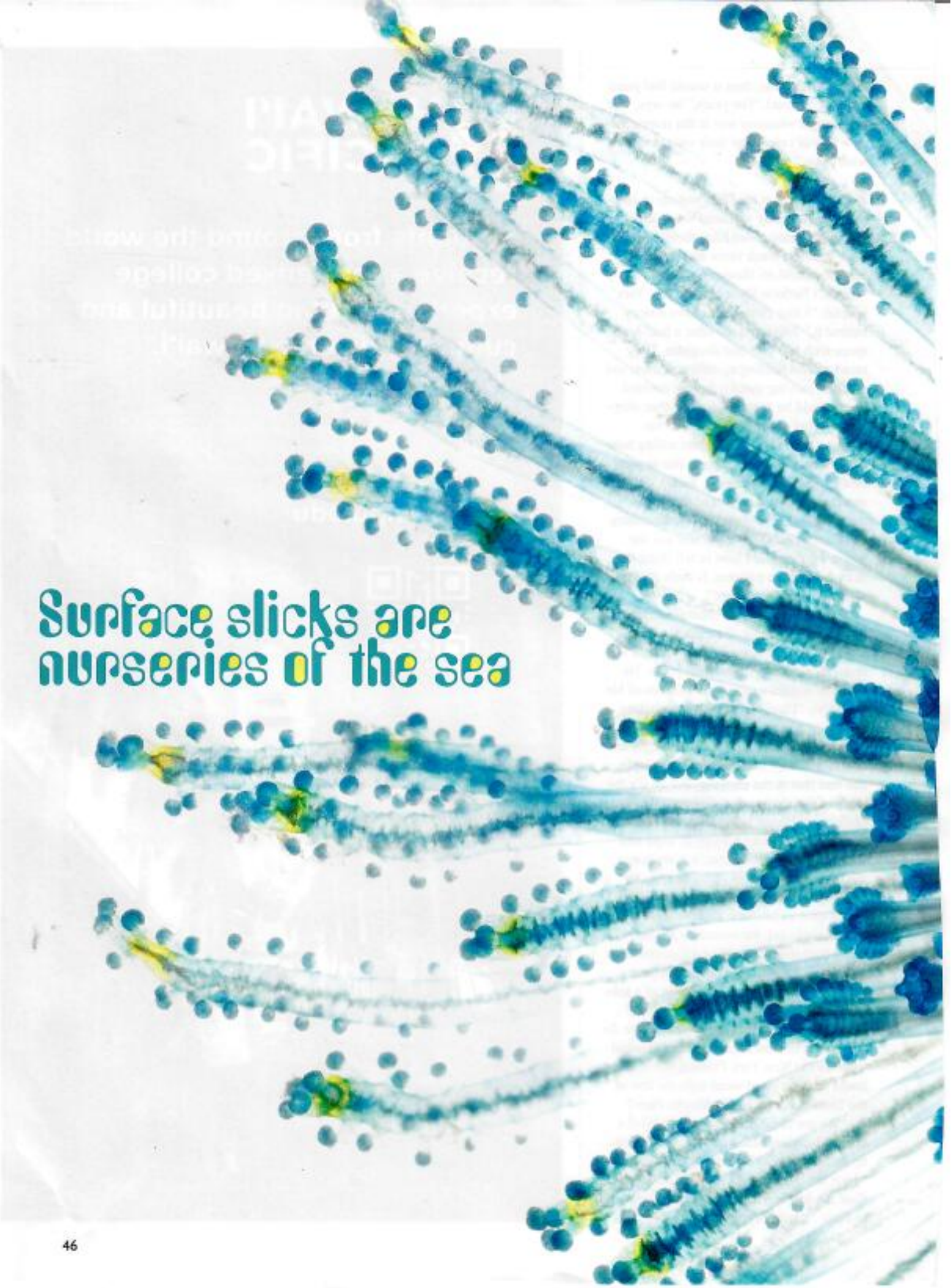
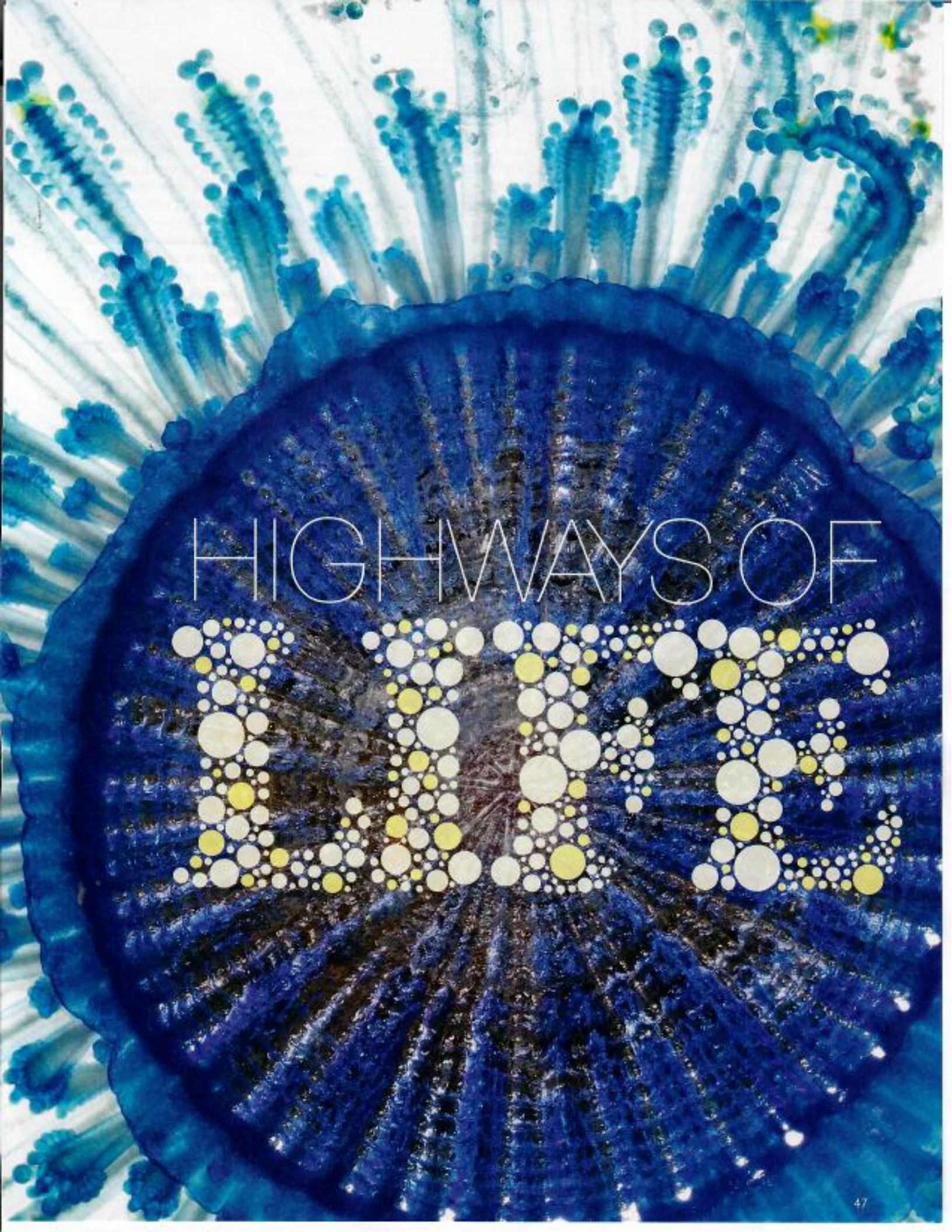


Surface slicks are nurseries of the sea


HIGHWAYS OF
LIFE

You see them from high cliffs or when flying over the water: those mysterious, silky lines

of calm water that stretch for miles, like rivers of glass on the surface of the sea. They seem paradoxical—how can they appear so placid when the waters on either side are chopped by wind? What causes them? Native Hawaiians have long recognized this phenomenon and coined many words to describe it. The song "Kona Kai 'Ōpua" references "ke kai mā'oki'oki," or "the streaked sea" of Kona. Sea slicks form when currents, tides and subsurface waves converge, and—as a recent study shows—they hold a key to another mystery.

Juvenile marine animals have long perplexed scientists. Many saltwater species hatch in nearshore waters, then seem to vanish for the duration of their larval stage before reappearing as adults. Where do they go? How do they survive? Hawai'i researchers began answering these questions by investigating sea slicks. Plankton and debris collect in these temporary habitats, which occur worldwide and are especially common along the leeward coast of Hawai'i Island. "We had an inkling that they were important," says marine ecologist Jonathan Whitney. "Slicks are such huge, visible habitats on Hawai'i Island, but they had never really been studied before."

Whitney embarked on a four-year study along with scientists from the National Oceanic and Atmospheric Administration and various universities. The team conducted 132 surveys off the Kona coast, towing a net through slicks and surrounding waters. What they found amazed them: Slicks host a remarkable diversity of marine larvae—several orders of magnitude richer than adjacent waters. Some fish species were a hundred times more abundant in slicks; others were found exclusively in the surface convergences. "That was really a shocker," says Whitney. "It suggests that they're dependent on slicks."

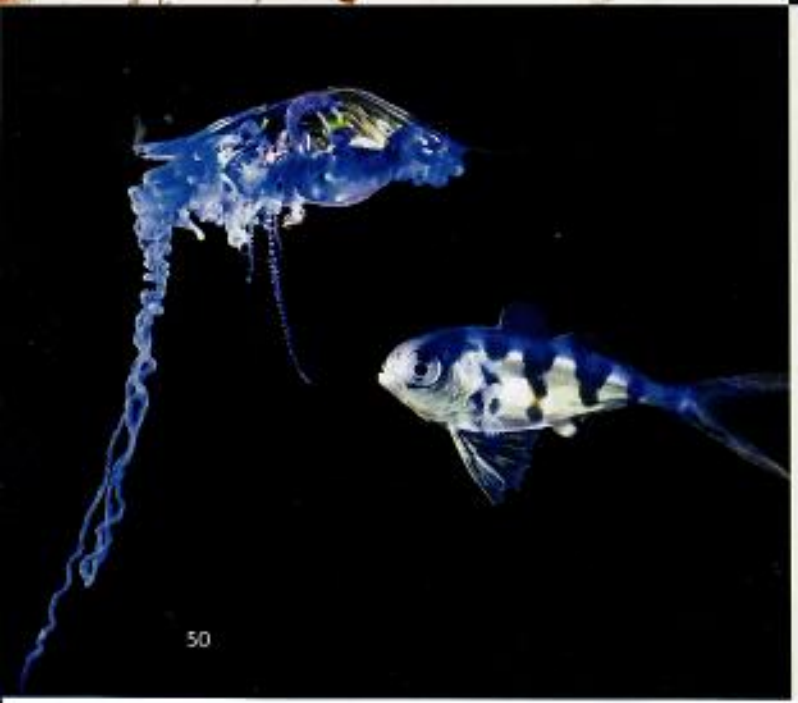
Sea slicks offer the protection of floating debris and plentiful phytoplankton for food. Whitney's study, published in 2021, reveals that Hawai'i's slicks serve as makeshift nurseries for the larvae of at least 112 species. The tows turned up a remarkable mix of reef fish (such as mackerel scad and goatfish), pelagic predators (billfish and jacks) and denizens of the deep (anglerfish) in addition to larval crabs, octopus and squid. Even more astonishing? Surface slicks are dynamic, ephemeral ocean features that don't last long—they might have a life span of mere hours. Which means that day- or week-old fish must swim from slick to slick to remain in their protection. "These larvae have really impressive abilities," Whitney says. "As soon as they're born, they can swim and navigate via smell or light."

Slicks are critical to replenishing adult fish populations and ultimately feed multiple ecosystems. "These are nursery grounds for fish to develop and then provide food for many parts of the food chain—the reefs, the pelagic regions, the deep sea and even up in the air—a lot of these animals are fed on by seabirds," says Whitney. "I love that slicks have an influence far beyond that little stretch of water that we see."

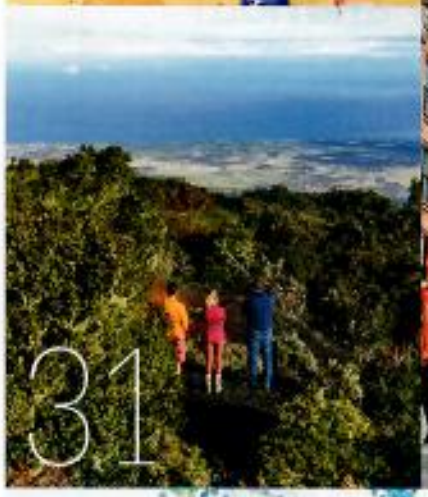
TEXT BY **SHANNON WIANECKI** | PHOTOS BY **DAVID LIITTSCHWAGER & JONATHAN WHITNEY**

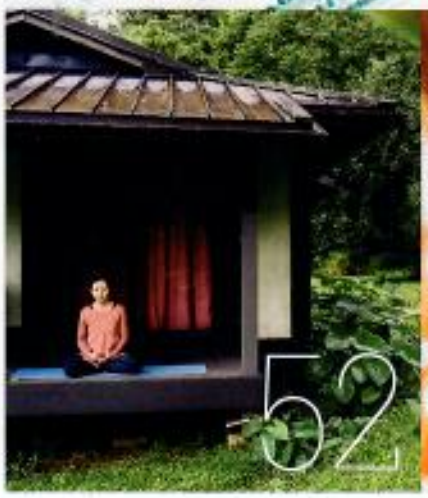
Sea slicks, seen here as light-colored streaks running parallel to the Kona coast, serve as nurseries for baby fish and larvae. Pictured on the opposite page, clockwise from top left are the larval forms of six species: the megalopa stage of an unidentified crab species; giant trevally (*Caranx ignobilis*); day octopus (*Octopus cyanea*); anglerfish (*Melanocetus johnsonii*); an unidentified larval squid; and shortbill spearfish (*Tetrapturus angustirostris*). Once mature, these creatures will inhabit every marine ecosystem; the blue button jellyfish (*Porpita porpita*) featured on the opening spread will drift across the open ocean, while the squid and octopus inhabit coral reefs. Sea slicks aren't wholly safe habitats: Within a day or two of hatching, tiny pelagic predators start hunting their nursery mates. When Whitney scooped a centimeter-long spearfish from the net, the bug-eyed brute attacked his finger. He couldn't help but laugh. "You're barely bigger than a grain of rice!" But these Lilliputians grow fast: The month-old trevally seen on the facing page will soon gain as much as 175 pounds. Among Whitney's most interesting discoveries: deep-sea dwellers in the slicks. Anglerfish spend most of their lives in the total darkness of the abyssal zone. Their eggs that float up to the surface, where the larvae hatch in the sunlight, congregate in sea slicks, then return to the depths. "Imagine you're three weeks old and you go on a journey to the bottom of the sea by yourself," says Whitney. "You sink two thousand meters through water pressure that would destroy our bodies, into total darkness and near-freezing temperatures. That's a massive distance for a creature of that size, into a completely different world."

All photos with white background by David Littschwager and all photos with black background by Jonathan Whitney



The baby porcupinefish (*Diodon hystrix*) seen here is smaller than a peppercorn — and that's after puffing itself up to look larger. Its soft spines will calcify as it grows basketball-size and bounces off to occupy the reef. Whitney has high praise for the scrawled filefish (*Aluterus scriptus*), pictured on the opposite page, top left. "Filefish are amazingly elegant dancers; they twist and do flips. We usually find them in groups, which suggests that they're already schooling at that size." This specimen is a centimeter long and "shaped like a squished violin." Filefish larvae exist almost exclusively in slicks. So do mālolo, or flying fish (opposite page, middle right), which lay their eggs on floating debris. Hatchlings hide from dive-bombing seabirds beneath the debris. The harassed fish then take flight using winglike fins to flee hungry dolphins and mahimahi. The gorgeous *Clio pyramidata* (opposite page, bottom left) might look like it has wings, but this sea butterfly is actually a snail. One of many invertebrates found in the slick, *C. pyramidata* swims among the fish larvae before sinking to the sand and growing a shell. *Physalia physalis*, the Portuguese man-of-war (opposite page, bottom left), is among the most feared mariners thanks to its stinging tentacles, which grow up to 160 feet long. It's shown here beside a blue-speckled man-of-war fish (*Nomeus gronovii*). Both the fish and the blue angel sea slug, *Glaucus atlanticus* (opposite page, top right), are immune to the man-of-war's toxin. The contents of a slick tow (opposite page, middle left) reveal a microscopic universe drawn up in a single dip of a hand net.





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