

Contributors



JACOB LORINC

JOHN LORINC

Sun power, page 38

Toronto journalist John Lorinc lives with his wife and two sons in the neighbourhood where the West Toronto Initiative for Solar Energy got started. "Last fall, I started noticing contractors were installing solar systems on homes all over the area, which was really inspiring and quite unusual," he says. "We're looking at putting one on our roof. It's something very practical you can

do to cut emissions, and you end up saving some money as a bonus." Lorinc writes about urban affairs for *The Globe and Mail*, *The Walrus* and *Spacing* magazine. He is the author of *The New City: How the Crisis in Canada's Urban Centres is Reshaping the Nation* (Penguin Canada), which was listed as one of *The Globe and Mail's* Top 100 Books for 2006.

KATHERINE GORDON

No reservations, page 48

Katherine Gordon worked as a treaty negotiator in her native New Zealand before moving to British Columbia in 1999. In the ensuing four years as a chief provincial government treaty negotiator, Gordon had numerous discussions with Tsawwassen Chief Kim Baird about how a treaty might improve the well-being of her people. "First Nations in Canada face so many challenges," says Gordon. "In a treaty, they're looking for something better out of life."



CAROLYN DAVEY

ANNIE MERCIER AND JEAN-FRANÇOIS HAMEL

Voyage to the slope of the deep dark sea, page 64

"Probing the deep recesses of the ocean is almost like exploring a new world," says Annie Mercier, a Memorial University of Newfoundland faculty member who co-led the CCGS *Hudson* research cruise in 2007. "Some of the deep-sea critters are so surreal," adds husband and long-time research colleague Jean-François Hamel. "It's hard to

imagine aliens being any weirder." For the past 16 years, the two marine biologists have been sharing their passion for the aquatic realm through articles, documentaries and books, including *The St. Lawrence: The Untamed Beauty of the Great River* (Les Éditions de l'Homme).



OLIVIER HAMEL

RAY CONLOGUE

Hippie homesteaders, page 74

"My memories of back-to-the-landing in New Brunswick are about strumming guitars, building odd little houses with hand tools and enjoying the euphoria of Beatles-era youth culture," says writer Ray Conlogue. "It was great going back there last summer and renewing friendships with those who stayed and built businesses and families. They lived their dream and made one small part of the world better." Conlogue was an arts journalist at *The Globe and Mail* for nearly three decades and has recently published a novel for young adults.



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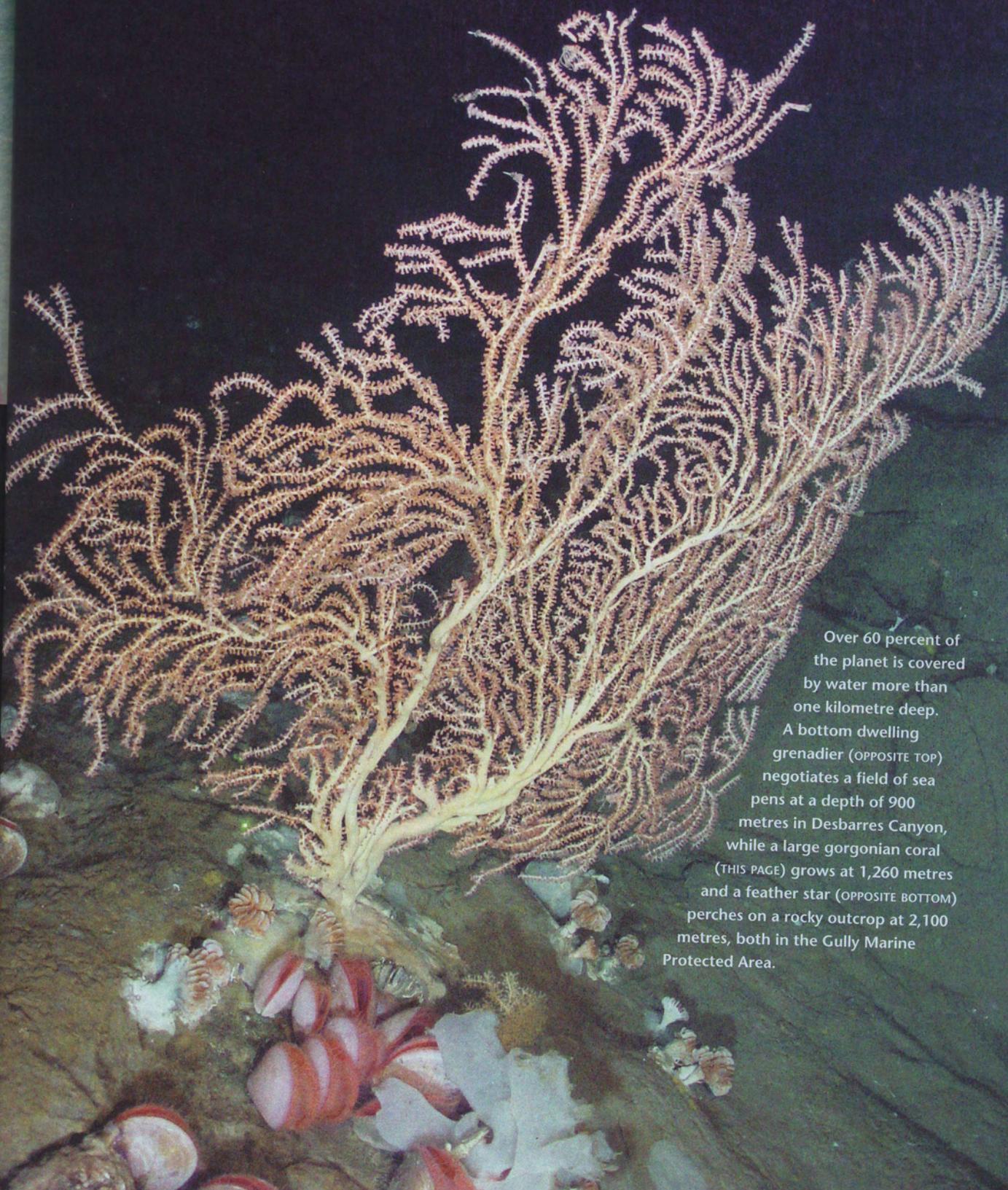
VOYAGE TO THE SLOPE

BY ANNIE MERCIER AND JEAN-FRANÇOIS HAMEL

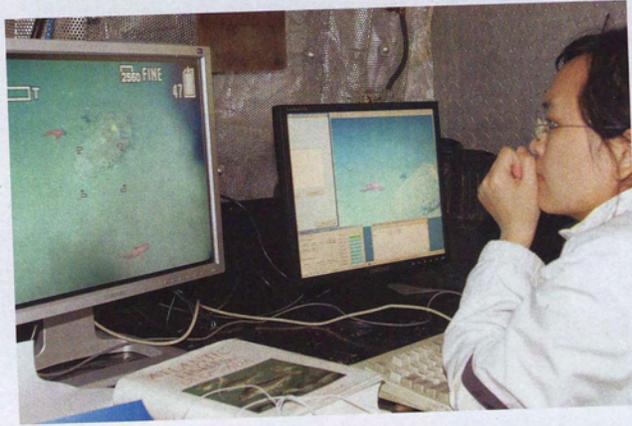


OF THE DEEP DARK SEA

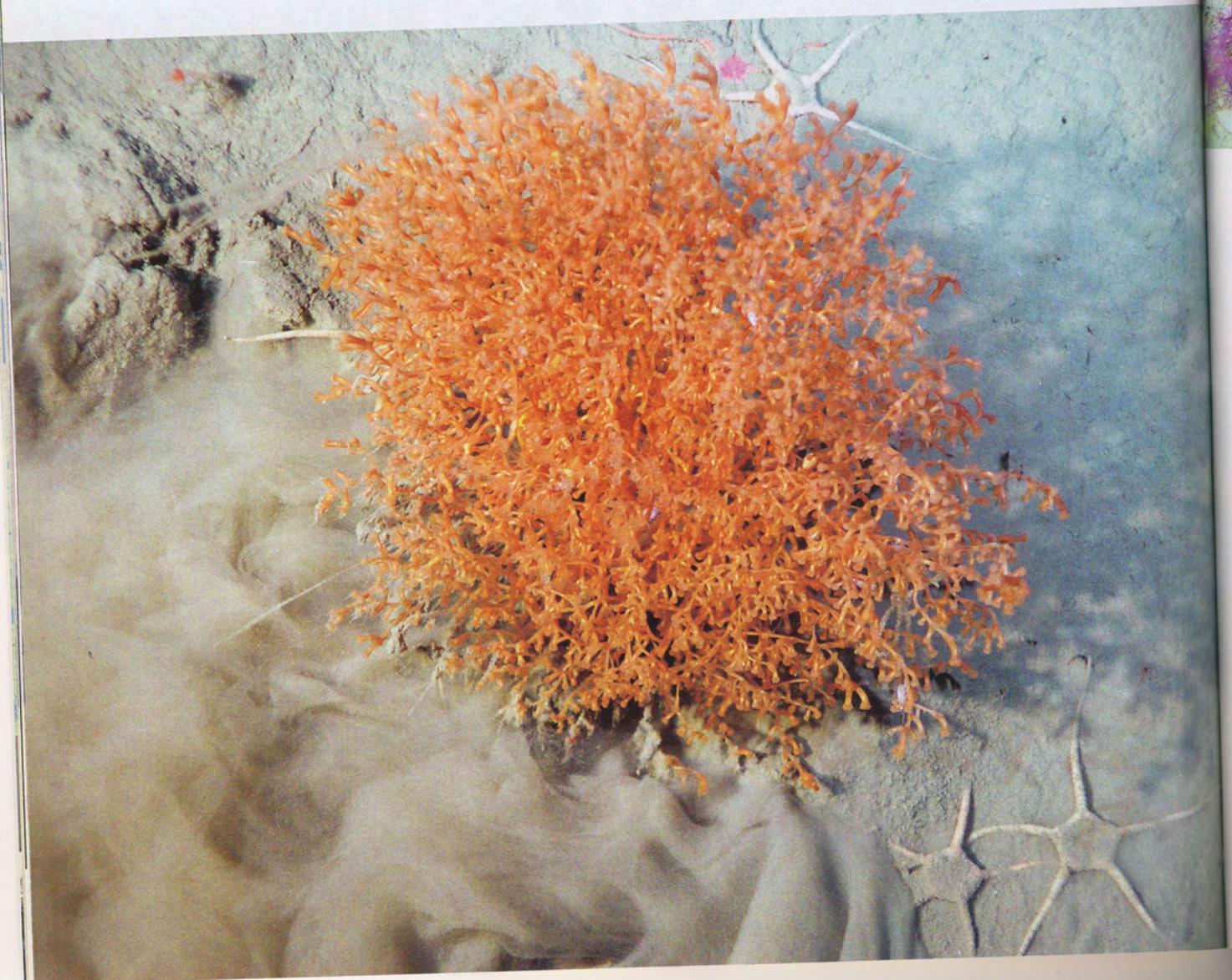
A crew of scientists and submersible pilots reveals secrets of the continent's submarine margin

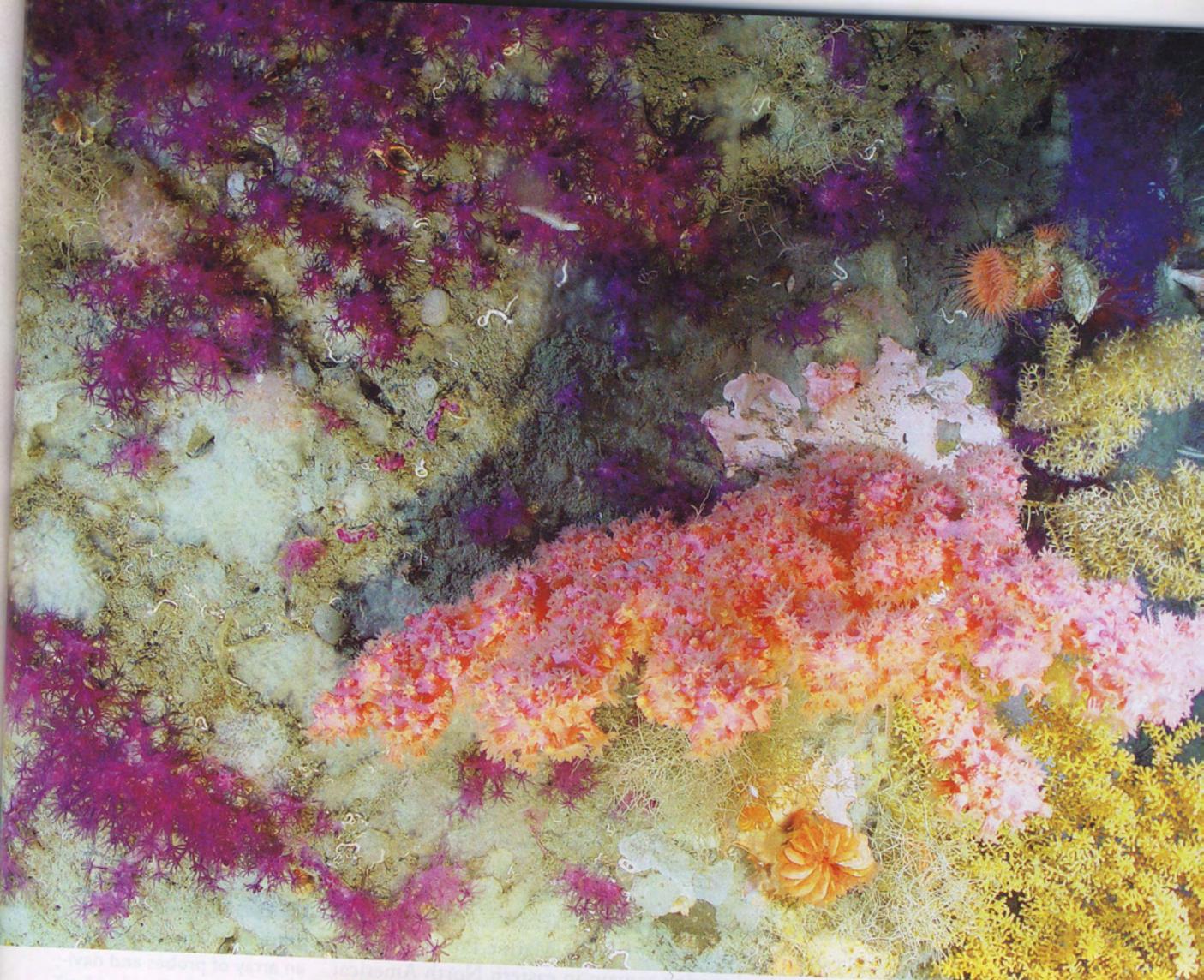


Over 60 percent of the planet is covered by water more than one kilometre deep. A bottom dwelling grenadier (OPPOSITE TOP) negotiates a field of sea pens at a depth of 900 metres in Desbarres Canyon, while a large gorgonian coral (THIS PAGE) grows at 1,260 metres and a feather star (OPPOSITE BOTTOM) perches on a rocky outcrop at 2,100 metres, both in the Gully Marine Protected Area.



THE CANADIAN COAST GUARD SHIP *Hudson* sways to the rhythm of a lazy North Atlantic swell, its red belly barely breaking the surface of the water. The sun peeks through a thin veil of fog. It is a perfect day at sea in July 2007, especially in these moody waters 250 kilometres south of Newfoundland, but there is hardly a soul on deck. All the action is happening deep in the gloomy confines of the overcrowded forward lab. Fans hum and chairs creak as 10 pairs of eyes focus intently on monitors that, for now, display only whitish specks on a deep-blue background. A murmur, a hushed reply and, suddenly, "Bottom!"





PREVIOUS PAGES AND THESE PAGES: DEPARTMENT OF FISHERIES AND OCEANS CANADA, OPPOSITE TOP: ANNIE MERCIER AND JEAN-FRANÇOIS HAMEL



Deep-sea corals were discovered more than 200 years ago, but most of what is known about them has been learned only in the past few decades. These largely colonial animals provide habitat for ecologically and commercially valuable fish species. Aboard the CCGS *Hudson*, Memorial University master's student Zhao Sun (OPPOSITE TOP) views video imagery of the sea bottom. Thousands of creatures were observed during the cruise, including a coral garden (TOP) near the Lophelia Coral Conservation Area, black coral (LEFT ABOVE) in Haddock Channel and bamboo coral (OPPOSITE BOTTOM) in Desbarres Canyon. A suction device is used to collect a spiky sea urchin (LEFT BELOW) in the Gully.



Joyous shouts erupt in almost perfect unison, unleashing a flurry of excitement that transforms the control room into a buzzing hive. Nearly two kilometres below, after dropping for 90 minutes at a rate of 20 metres a minute, the unmanned submersible ropos (Remotely Operated Platform for

Ocean Science) has finally arrived at the sea floor.

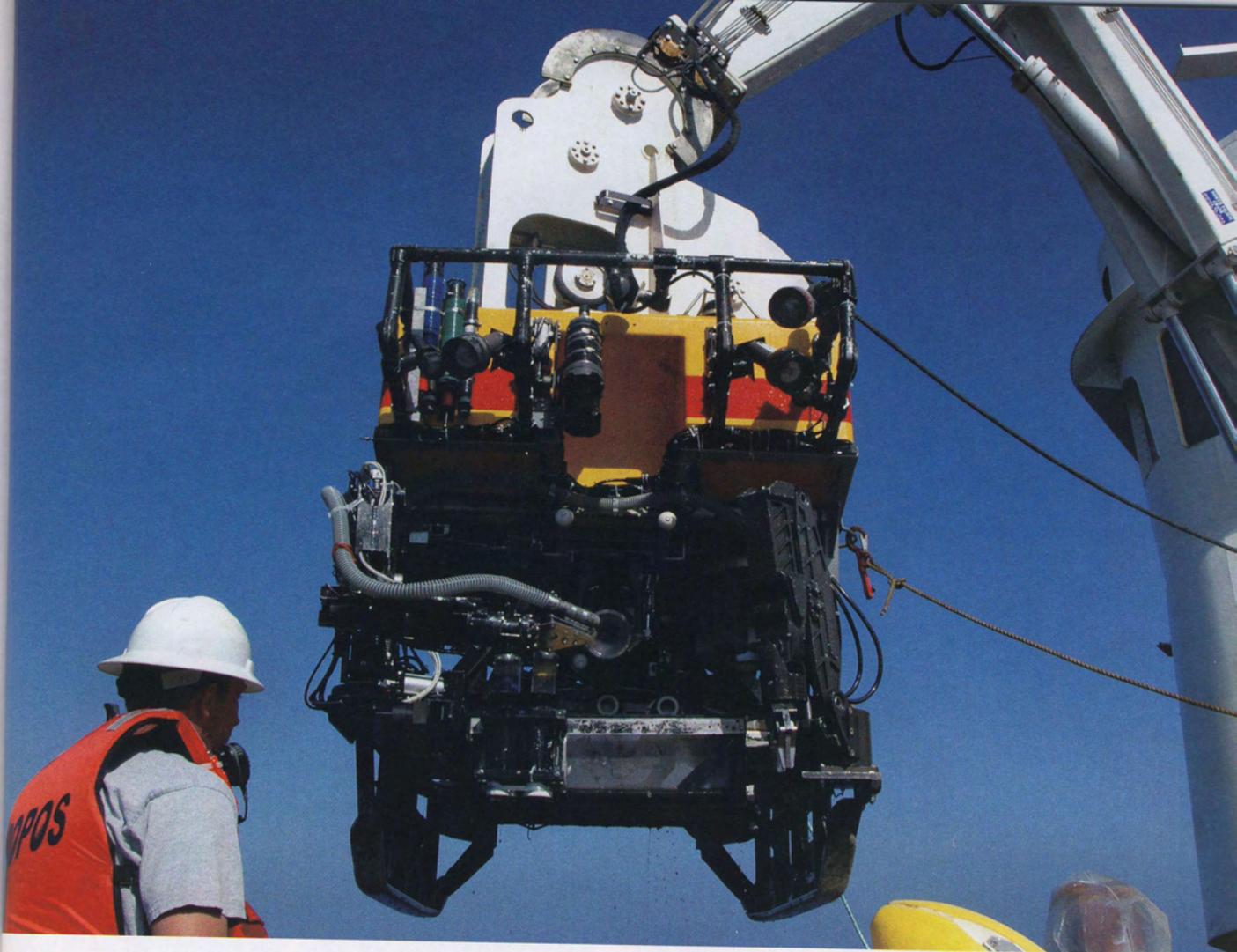
Canyons, plains, mountains, coral reefs — most of the Earth's large-scale geographical features have remained hidden in the recesses of the sea, out of sight and out of reach. But not anymore. For the next 20 hours, the sub will roam the fathomless night of the abyss, the cameras and robotic claws helping the scientists above, who are intent on elucidating the mysteries of this never-before-explored tract of the continental slope.

Sailing out of Halifax, our team of 20 scientists is an assorted bunch, including oceanographers, marine biologists, taxonomists and biogeochemists. Most are affiliated with Memorial University of Newfoundland in St. John's or the Department of Fisheries and Oceans Canada (DFO). The expedition, largely funded by DFO, with a contribution from the Natural Sciences and Engineering Research Council of Canada, will explore four features of the continental slope: the Gully Marine Protected Area, the largest submarine canyon in eastern North America; the Lophelia Coral Conservation Area, about 260 kilometres southeast of Louisbourg, N.S.; and Haddock Channel and Desbarres Canyon, at the southwestern margin of the Grand Banks of Newfoundland.

Tethered by an armoured electrical-optical cable (TOP) and equipped with numerous cameras, two manipulator arms, a suction sampler and an array of probes and navigation sensors (OPPOSITE TOP), the Canadian-owned ROPOS submersible can dive to 5,000 metres. Its robotic claw (OPPOSITE, BOTTOM LEFT) is carefully positioned to collect a sea star at a depth of 1,900 metres in the Gully. DFO's Cynthia Bourbonnais-Boyce retrieves sea star samples from the sub's holding tank (OPPOSITE, BOTTOM RIGHT). The 21-day expedition concentrated on four regions of the continental slope (MAP).



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modified ROPOS
diver to
robotic
(BOTTOM LEFT) is
used to collect
samples at a
depth of 1,900
m. DFO's
Jacques-Boyer
collects
samples
from a
holding tank
(RIGHT). The
concentrations
of the
(MAP).



With a bit of wizardry, a mechanic transforms what looks like a small shovel into a device that can delicately select samples from the ocean floor. We dub it the 'super scooper.'



MAP: STEVEN FICK/CANADIAN GEOGRAPHIC

ALL: ANNIE MERCIER AND JEAN-FRANÇOIS HAMEL; BOTTOM LEFT: DEPARTMENT OF FISHERIES AND OCEANS CANADA



Once the sub is secure, we sort the specimens and swiftly carry them to their new quarters.

The deep sea is probably the planet's largest, most diversified and least understood habitat. The continental slope roughly defines its margins, forming a transition zone between the outer edge of the continental shelf and the ocean basins. Some of the richest and most vulnerable underwater coral gardens are found along the 500-to-2,500-metre-deep slope off the Scotian Shelf and the Grand Banks.

Centuries-old fan corals, huge octopuses, swimming sea cucumbers and alien-looking fish find refuge in the silent embrace of the deep. Strangely, this dark world often teems with bright colour and iridescent light, its denizens having evolved a complex array of lures and disguises. All things in this harsh environment, where cold and crushing pressures reign, seem strange to the human eye.

AT LEAST ONE SCIENTIST on board has more interest in ghostly remains than in the abundant life or rugged scenery. Owen Sherwood, a post-doctoral fellow in the biogeochemistry of deep-sea corals at Memorial, perks up whenever a sturdy yet lifeless coral branch is sighted. Using radioisotope dating, Sherwood studies fossilized and recently dead corals

in search of the unique radiocarbon signatures of different water masses, such as the Gulf Stream and the Labrador Current. Because corals are so long-lived, they may contain an internal record of changes in ocean currents over the past 2,000

years. He has already determined that some colonies off Nova Scotia are eight centuries old, leaving us to ponder why trawlers are permitted to wipe out deep-sea reefs that take so long to develop.

"There's no such thing as sustainable bycatch of deep-sea coral," says Sherwood. "Once the corals are knocked down, they're pretty much gone forever."

For Krista Baker, who is gathering data for her doctoral thesis, the name of the game is fish. Eyes riveted to the monitor, she checks the fixed-camera angle and speed of the sub to make sure the video transects will be useful for her comparison of fish abundance and diversity within and outside the coral areas.

Bringing the deep sea to the laboratory, ROPOS gently places a specimen in its "bio-box" (TOP LEFT). Collecting live animals was a critical goal of the expedition. Two coral polyps (TOP RIGHT) and a sea star larva (ABOVE LEFT) were born in tanks at Memorial University. The taxonomists are still trying to identify what species this translucent sea cucumber (ABOVE) belongs to.

TOP LEFT: DEPARTMENT OF FISHERIES AND OCEANS CANADA; OTHERS: ANNIE MERCIER AND JEAN-FRANÇOIS HAMEL



A longnose chimaera, a primitive scaleless fish with a protruding snout, flashes by, and everyone gasps, wishing the eye of the camera could follow the weird creature.

The mission has yet another purpose. Stunning videos, ancient skeletons and pickled samples of deep-sea animals are useful, but what we really want is to bring some of them back alive. This is rarely attempted in marine science and success stories are few, for a number of reasons. The change in pressure is fatal to most fish (but not most invertebrates) and marked changes in temperature, as may occur in tropical waters, are difficult and often fatal for both. Cold-water holding tanks keep samples alive for a limited time, but the ship may not return to a port close to the lab, as ours did. It would have been nearly impossible to transport live deep-sea animals from Halifax to the lab in St. John's.

Some deep-sea invertebrates do survive in captivity. Specimens scooped up in bottom-trawl surveys, including sea stars, soft corals and sea anemones, have been living in the lab at Memorial for more than a year. And, on this voyage, we get to see these creatures in their natural habitat, then collect them one by one as carefully as we can.

For this task, ROPOS has to develop a gentler side to its already versatile persona. After witnessing the remnants of samples squished by the robotic claws during the first segment of the cruise, Zhao Sun, a master's student working on the reproduction of bathyal corals, is not optimistic about collecting live colonies. But with a bit of wizardry, mechanic/pilot Rodger Adamson transforms what looks like a small shovel into a device that can delicately select samples from the ocean floor. We dub it the "super scooper." In the hands of pilot/engineer Reuben Mills, or any of his colleagues, for that matter, the scoop truly becomes a life-preserving tool.

As ROPOS surfaces with its underbelly full of live specimens, we get ready to transfer the precious cargo to a custom-made intensive-care unit. A rusty refrigerated container has been outfitted to hold four tanks of chilled seawater. Once the sub is secure on deck, we sort the specimens and swiftly carry them to their new quarters. Keeping them alive and well until we reach St. John's will be another challenge. But, for now, it's time to get ROPOS ready for another plunge.

In all, we spend 21 days at sea, working around the clock, sometimes against the whims of the very sea we are trying to probe. In the weeks and months that have followed, the DFO scientists are still doggedly working to confirm what may well be several dozen new species records for Eastern Canadian waters. Elated and daunted, Baker labours away at processing countless hours of fish-filled video footage. Sherwood slices and dates his calcareous relics. And Sun just pinches herself. How could she have imagined that, come year-end, she would be raising and reproducing a whole new generation of creatures from the deep dark sea?

Marine scientists Annie Mercier and Jean-François Hamel are also writers and photographers whose work has been featured in magazines internationally. They helped design "The Abyss," an exhibition at the Musée du Fjord in La Baie, Que., opening June 3 and scheduled to tour museums nationwide.

A cup coral (ABOVE LEFT) is kept alive in the lab while scientists study its reproductive behaviour. This globular sponge (ABOVE) was found at a depth of 630 metres.



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