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NATIONAL GEOGRAPHIC

Exploiting the Ocean's Bounty

Diminishing Returns

NATIONAL GEOGRAPHIC MAGAZINE

BY MICHAEL PARFIT

PHOTOGRAPHS BY ROBB KENDRICK

DIMINISHING RETURNS

Exploiting the Ocean's Bounty

The unthinkable has come to pass: The wealth of oceans, once deemed inexhaustible, has proven finite, and fish, once dubbed "the poor man's protein," have become a resource coveted—and fought over—by nations. Although technology has helped quadruple the world's catch of seafood since 1950, a nearly empty basket is all a fisherman in Cochin, India, has to show for several hours' toil—a complaint heard around the world. "We've come to our reckoning," says one marine scientist. "The next ten years are going to be very painful, full of upheaval for everyone connected to the sea."

Salmon fever "I'd be crying the blues if we only made $50,000," says crewman Scott Hansen, in yellow, of his boat's earnings from sockeye salmon runs in Alaska. Each summer 1,800 drift-net crews scramble after

salmon in Bristol Bay—one of the few thriving fisheries in the United States. Competition is cutthroat; top boats can gross $250,000 in a few weeks. "It's tense—not for the fainthearted," Hansen says.

Beached by technology Village fishermen repair handmade nets near Safi, Morocco, before setting out in rowboats to face their competition—modern European trawlers. Worried about overharvesting,

Morocco wants to reduce fish quotas taken in its waters by foreign fleets. "People using traditional techniques will not survive," asserts one Moroccan official. "The waters are being emptied by industrial fishing."

THE SEA IS DARK with rain. The sky is cold with winter. In Vigo, on the west coast of Spain, the big ships slip out of the harbor as softly as ghosts: The *León Marco Cinco*, heading north for ice-strewn, windy seas; the *Farpesca Cuarto*, going south to the Falkland Islands for squid; and, most fatefully, a 256-foot trawler called the *Estai*, whose journeys will eventually bring it under gunfire in the North Atlantic. The ships—the most capable fishing vessels the world has known—vanish into the rain long before they hit open water; their departure seems as steady and silent as if they had just faded away.

"There will always be shoemakers and fishermen," Lazaro Larzabal told me before he left. He is skipper of the *León Marco Cinco*. But he sounded too insistent, as though he didn't quite believe it. Like all fishermen, he knows there's trouble at sea.

The trouble is simple: There are too many fishermen and not enough fish. This is not yet a crisis in the dire terms to which the world is accustomed—there are no long lines at fish markets with empty stalls, no skyrocketing prices, no famine on the beach. The annual catch from the sea has peaked at about 78 million metric tons (86 million short tons) of fish, and seems stable—so far. But several factors worry those who rely on the sea for food and money.

A 50-year boom in fishing technology has created an immensely powerful industrial fleet—37,000 ships crewed by about a million people worldwide—based on freezer trawlers that can catch and process a ton or more of fish an hour.

Small-boat, traditional fishermen probably number 12 million, yet they catch only about half the world's fish. In some poor countries a small boat and a basket of line may be the last chance for a man to survive.

In many places fish stocks are being damaged by pollution, by destruction of wetlands that serve as nurseries and provide food, by the waste of unprofitable fish (called "bycatch"), and, above all, simply by overfishing. As a result of these changes, some fish stocks have collapsed, and many important groups of fish are fished either to the sustainable capacity or beyond it.

As I watch the ships leave Vigo, moving inexorably into a season, a year, perhaps a decade of conflict, I wonder if this problem can be resolved before it grows into a catastrophe. It doesn't look easy. Fishing is a 70-billion-dollar-a-year industry with deep roots in national pride and culture and an age-old tradition of freedom, but as governments struggle to solve the problems at sea, they inevitably create laws that challenge that freedom. The outcome is turmoil. In the year and a half that I follow the story, I see solutions as well as

Fishing goes global

Designed to swallow 60 metric tons of fish per haul, the Icelandic freezer trawler *Svalbakur* (facing page) combs icy home waters. Declining fish stocks in Europe have forced some fleets to seek opportunity elsewhere. Boats from Vigo, Spain, Europe's largest fishing port (above), roam from Africa to Greenland.

MICHAEL PARFIT, a frequent contributor whose last story took him aboard the Canadian Pacific Railroad (December 1994), writes—and goes fishing when he can—in Montana. ROBB KENDRICK, a freelance photographer and landlubber who grew up in Hereford, Texas, has visited all seven continents on assignment for the magazine.

troubles, but real resolution is distant. Today's sea seems a battlefield in which glimpses of individual lives in conflict alternate with bulletins from a hundred fronts.

• NORTHWEST PACIFIC—*Russian border-guard ship shoots at two Japanese vessels accused of poaching in disputed water off the Kuril Islands. One ship hit and damaged; several fishermen injured.*

• SCOTLAND—*Scottish fishermen attack a Russian trawler and destroy 380,000 dollars' worth of cod.*

• PATAGONIA—*Argentine gunboat chases and fires on a vessel from Taiwan. Crew is rescued, but trawler sinks.*

The sea is white with wind; the sky threatens snow. I'm in Patagonia in midwinter. On the freezer trawler *Kongo*, tied up at Ushuaia, about as far south as civilization gets, Skipper Jorge Juárez is talking about disaster. "Fishing is coming down abruptly in the last three or four years!" he says. He speaks enthusiastically, even about bad news. "We are getting in trouble! Real trouble! We need to get clear in our minds the disappearing of the fish!"

Nobody disputes the notion that fisheries are in trouble, particularly fishermen. And almost every fisherman I talk with agrees that overfishing is the main culprit. Many blame forms of fishing other than their own—those who fish from small boats blame freezer trawlers. Freezer-trawler skippers blame trawler "pirates," who use illegal equipment, like fine-mesh nets. But some, like Skipper Juárez, blame themselves: "There is too much catching!" he says, showing me through his

Chewing up the food chain
Predators become prey at the Vigo waterfront, where sharks are unloaded for shipment to European and Asian markets. Once deemed worthless, shark meat—especially for shark-fin soup—has spawned a robust commercial fishery. Environmentalists warn that targeting such "apex" predators may endanger whole marine ecosystems. "It doesn't make sense," says one expert. "Sharks cull fish populations of weak and genetically unfit individuals." Some European sharks are already commercially extinct—victims of a human hankering for fish-and-chips.

335-foot freezer trawler. It is a vast, noisy labyrinth. He tells me he's retiring soon, and I pretend to appreciate the cramped processing rooms in which knife blades whir at my elbow. I crouch to avoid a low ceiling full of pipes that could smash your head even in a flat calm. Just tied at the dock, the big rusty vessel gives me the creeps.

"The fish is less and less!" Juárez says. "We have sons, grandchildren! We have to think of the future!"

Everyone thinks of the future. But who is actually doing something about it? No one here. On deck Japanese fishermen in hard hats bustle around in groups, watched by Argentine fishermen with long hair who stand smoking. The *Kongo*, part of an Argentina-Japan joint venture, will soon go to sea again under a new captain. Argentina needs the work, and Japan, which drives world prices with its vast demand, needs the fish (see "The Great Tokyo Fish Market," pages 38-55). The force of economics overpowers conscience.

"TV teaches us to drink Coca-Cola!" Juárez says with the usual enthusiasm. "It doesn't teach us to take care of the fish!"

• NORTH ATLANTIC—*Stern trawler* Rex *arrested west of Scotland for trespassing in British waters.* Rex, *like many ships that try to get around fishing laws, is multinational: owned by Icelanders, registered in Cyprus, and crewed by Faroe Islands fishermen.*

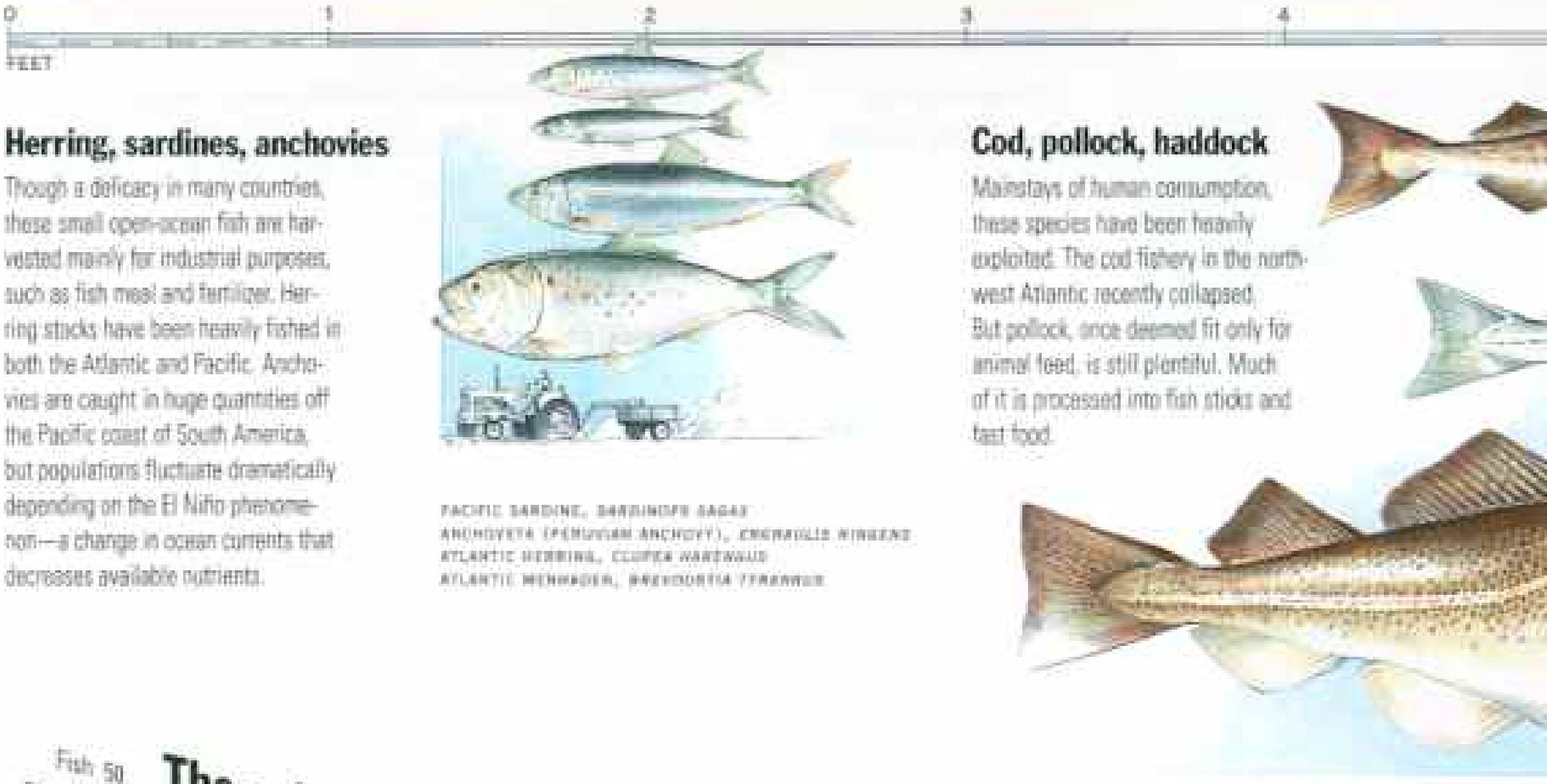
• SOUTH ATLANTIC—*Falklands patrol boat chases Taiwanese squid boat 4,364 nautical miles from home waters, all the way past South Africa. Falklands officers shout "Stop!" at boat for 13 days but never shoot. "We think shooting is excessive," says Falklands fisheries director. The boat gets away.*

"UNITED NATIONS conference could be last chance to avert collapse of world fisheries," proclaims a news release by an environmental coalition. The headline is an exaggeration, but as the second session of a UN meeting on high-seas fishing convenes in New York City in March 1994, it's clear that nations as well as environmentalists are worried—and far from agreement. Rhetoric boils with urgency, but the talks go slowly.

The conference is part of the encroachment of law on the free oceans that began after World War II. This process accelerated in the 1970s, when most nations pushed their territorial control from 12 to 200 nautical miles offshore to grab valuable fishing grounds, shoving the boats of other nations—the famous "distant-water fleets"—far out to sea.

This seemed dramatic at the time, but 200 miles is no longer enough. Many fish roam from national to international waters, where they're scooped up by intense fishing beyond the control of any nation. So nations whose rambling salmon, cod, or pollock are caught before they get home fight with those who intercept them.

For many nations this argument is still conducted in the relatively calm chambers of the UN. But more and more countries are taking the fight to sea. That's happening off Canada. When scientists recently decided that the once productive Grand *(Continued on page 19)*



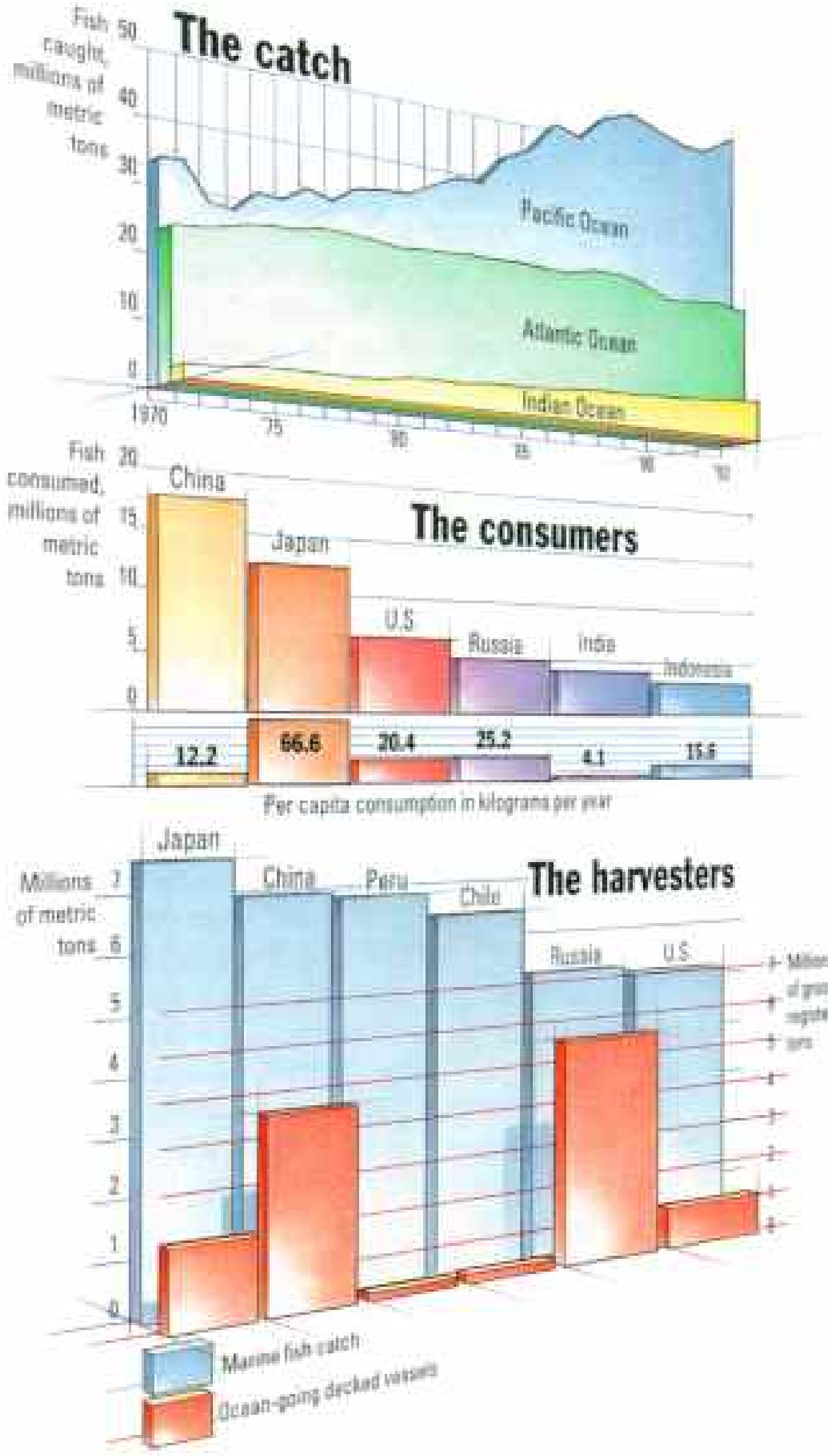
Herring, sardines, anchovies

Though a delicacy in many countries, these small open-ocean fish are harvested mainly for industrial purposes, such as fish meal and fertilizer. Herring stocks have been heavily fished in both the Atlantic and Pacific. Anchovies are caught in huge quantities off the Pacific coast of South America, but populations fluctuate dramatically depending on the El Niño phenomenon—a change in ocean currents that decreases available nutrients.

PACIFIC SARDINE, *SARDINOPS SAGAX*
ANCHOVETA (PERUVIAN ANCHOVY), *ENGRAULIS RINGENS*
ATLANTIC HERRING, *CLUPEA HARENGUS*
ATLANTIC MENHADEN, *BREVOORTIA TYRANNUS*

Cod, pollock, haddock

Mainstays of human consumption, these species have been heavily exploited. The cod fishery in the northwest Atlantic recently collapsed. But pollock, once deemed fit only for animal feed, is still plentiful. Much of it is processed into fish sticks and fast food.



ART BY C. BRUCE HERSEE

GRAPH SOURCE: FISHERY INFORMATION, DATA AND STATISTICS SERVICE, FAO. "THE CONSUMERS" AND "THE HARVESTERS" BASED ON 1992 DATA. VESSEL GRT TOTAL FOR U.S. IS FAO ESTIMATE.

Open Seas No More

No longer humanity's watery commons, nearly 40 percent of the world's oceans have been locked up by territorial claims and exclusive fishing zones. The rush to stake out these 200-nautical-mile limits began after World War II, when the advent of long-range fleets sparked clashes over fishing rights.

Expanding the boundaries, however, hasn't stopped overexploitation of prize commercial species (distributions shown on map). Rich nations buy into poor countries' waters. High-tech fleets nab fish migrating outside protected coastal zones. And the fish just keep getting scarcer—and smaller. Despite a rise in the Pacific Ocean catch (left, top graph) in the 1980s, the tonnage of seafood harvested worldwide has reached an ominous plateau after peaking in 1989.

Meanwhile, demand only grows. With an annual per capita consumption of 66.6 kilograms (147 pounds), Japan has the world's biggest appetite for fish, middle graph. China, busy expanding its fleet, is gaining rapidly in bulk catches, bottom graph. High Peruvian and Chilean catches reflect huge exports of fishmeal species from their waters.

WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA*
HADDOCK, *MELANOGRAMMUS AEGLEFINUS*
ATLANTIC COD, *GADUS MORHUA*

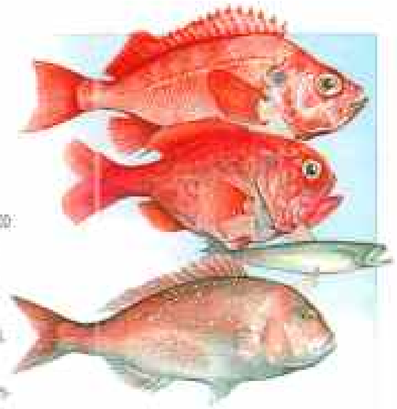
Jacks, sauries, capelins

Caught for both eating and industrial purposes, these fish are also key prey for larger, more favored food species such as cod or tuna.

CHILEAN JACK MACKEREL, *TRACHURUS MURPHYI*
CAPELIN, *MALLOTUS VILLOSUS*
PACIFIC SAURY, *COLOLABIS SAIRA*

Redfish, seabreams, roughies

As popular or easily accessible fish stocks are tapped out, fishermen turn to alternative species. Redfish, a restaurant staple, have been fished commercially since the 1930s. Fishing for orange roughy began only in the 1970s. The danger: Little is known about the biology of new food fishes. Some scientists assert that orange roughies may live longer than humans. If true, this late-maturing stock needs ample time to replenish itself.

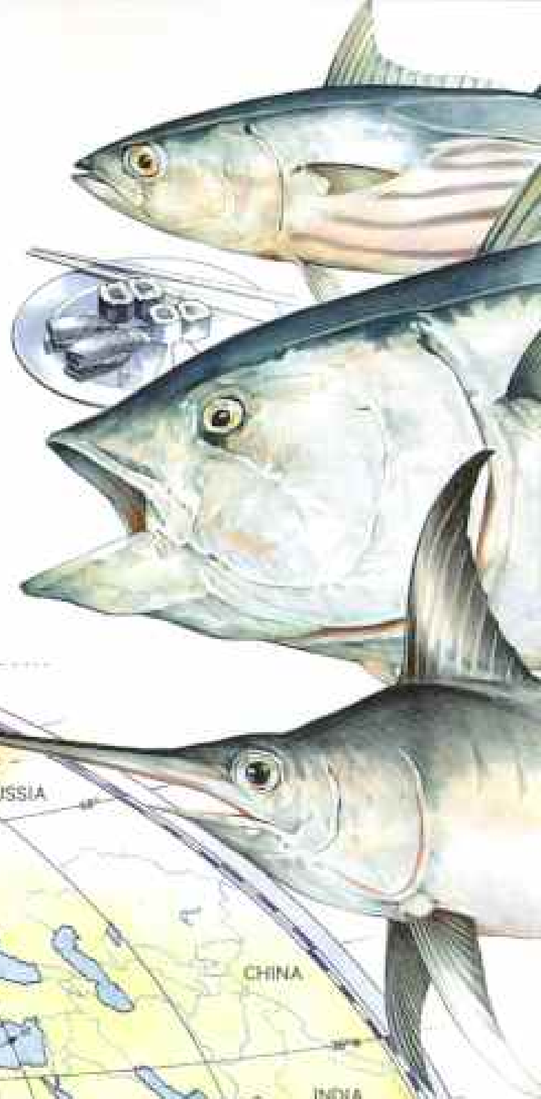


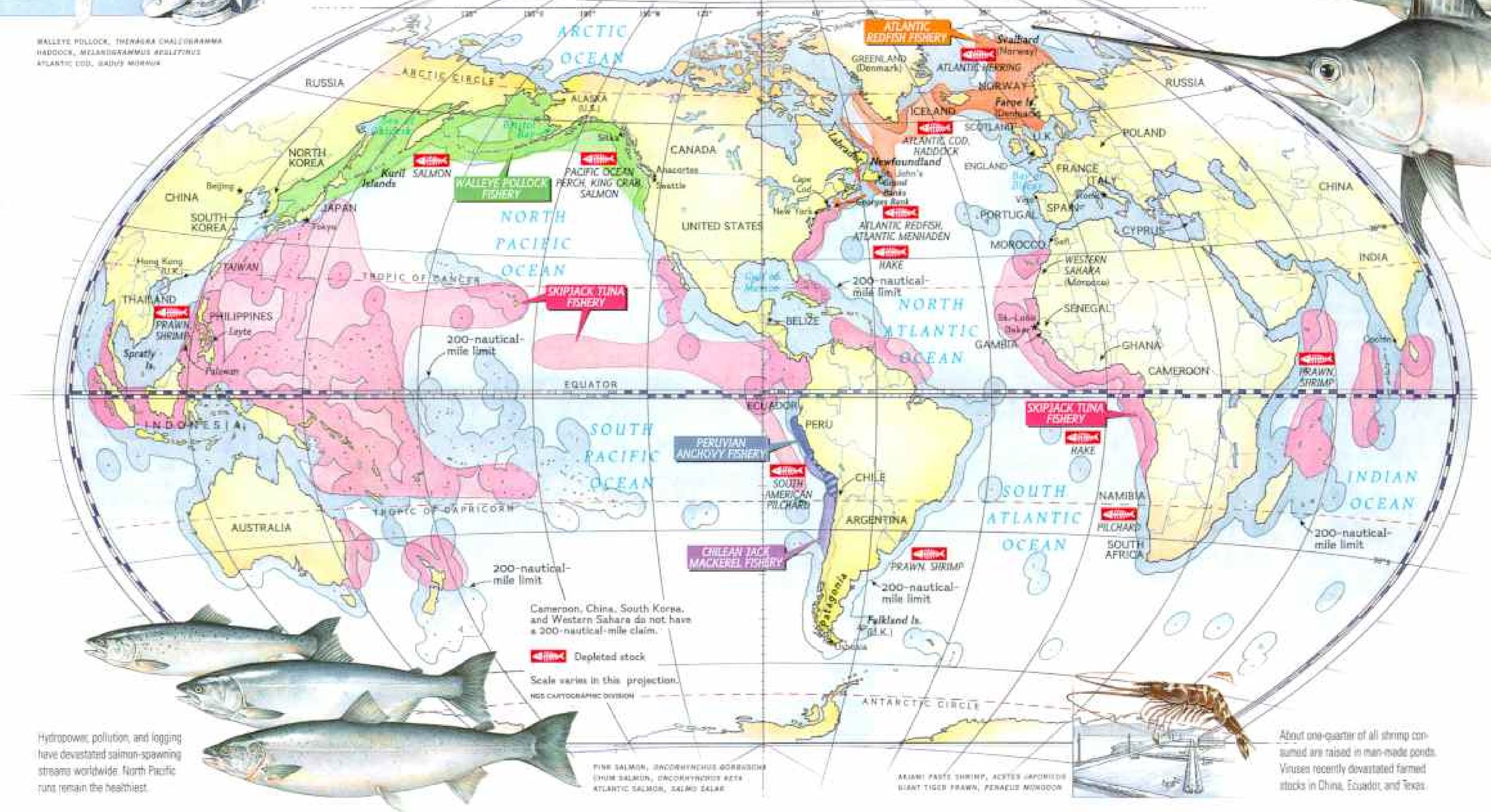
GOLDEN REDFISH, *SEBASTES NORVEGICUS*
ORANGE ROUGHY, *HOPLOSTETHUS ATLANTICUS*
BOMBAY-DUCK, *HARPADON NEHEREUS*
SILVER SEABREAM, *PAGRUS MAJOR*

Tuna, billfish

The glamour fish of the industry, tuna and billfish command luxury prices in the global market. A two-bite portion of sushi with prime meat from the belly of a bluefin tuna—whose Atlantic population has dwindled—can fetch $75 in Japan. Large fish are hunted with harpoons and spotter planes.

SKIPJACK TUNA, *KATSUWONUS PELAMIS*
BLUEFIN TUNA, *THUNNUS THYNNUS*
SWORDFISH, *XIPHIAS GLADIUS*





Hydropower, pollution, and logging have devastated salmon-spawning streams worldwide. North Pacific runs remain the healthiest.

PINK SALMON, *ONCORHYNCHUS GORBUSCHA*
CHUM SALMON, *ONCORHYNCHUS KETA*
ATLANTIC SALMON, *SALMO SALAR*

ARIAKE PASTE SHRIMP, *ACETES JAPONICUS*
GIANT TIGER PRAWN, *PENAEUS MONODON*

About one-quarter of all shrimp consumed are raised in man-made ponds. Viruses recently devastated farmed stocks in China, Ecuador, and Texas.

FACTORIES AFLOAT

Factory ships either catch their own fish or operate as mother ships for fleets of smaller vessels. In both cases the ability to process and package fish at sea has revolutionized the industry. Onboard, government agents monitor catch limits.

To illustrate all onboard operations, this ship is shown fishing and unloading cargo simultaneously.

1 Cod end

2

3 Reel

4

5

6

7

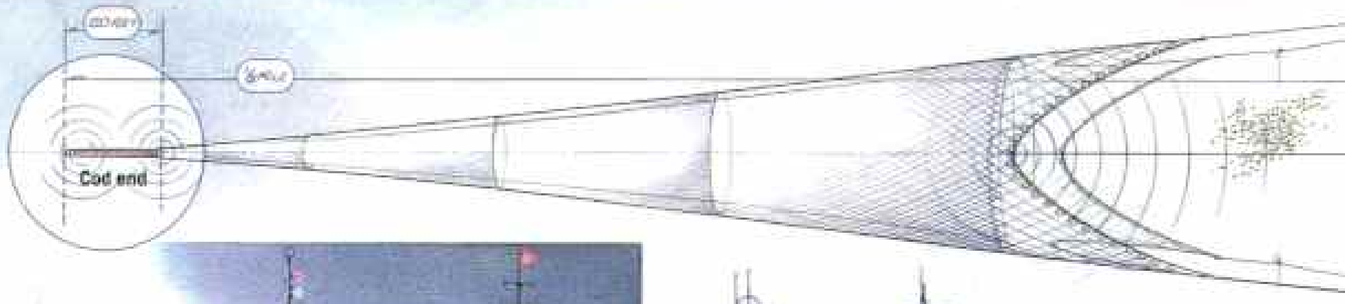
8

9

12

Environmental outcry has forced many tuna seiners to free dolphins trapped in their nets. Dolphins and tuna often swim together.

Sensors on the "cod end," or tip, of the net alert the crew to the volume of fish caught in each trawl.



PURSE SEINER

Working from a small skiff, seiners surround schools of fish with a curtain of netting and quickly cinch the bottom closed. Seiners catch pelagic fish such as tuna and herring.

SQUID JIGGER

Operating at night, squid jiggers snag schooling squid with weighted and hooked lines. The jigging motion is controlled by hydraulics. The "bait": powerful lights.

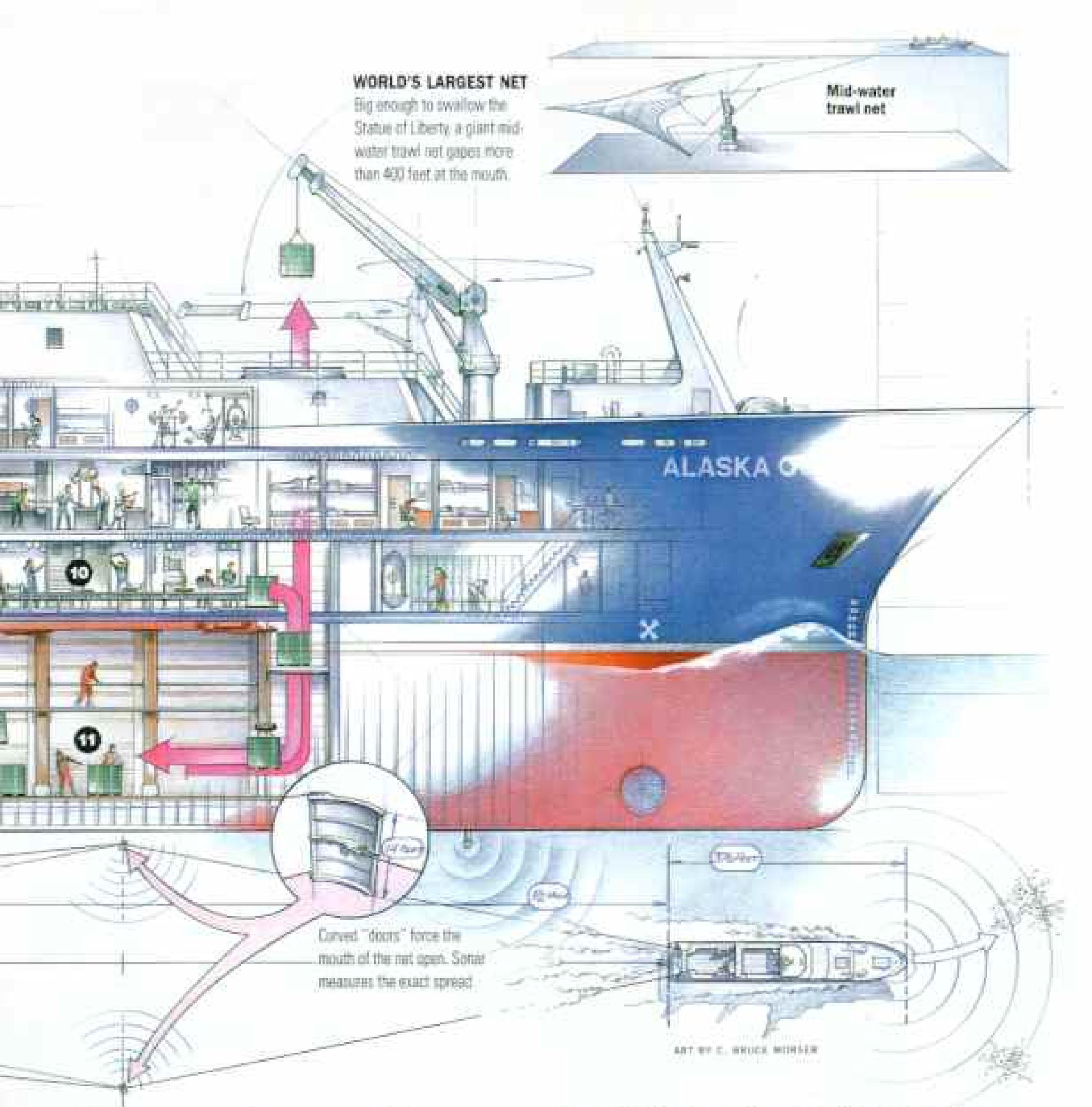
LONG-LINER

Like oceangoing spiders, these vessels spin out miles of fishing lines that dangle lures or baited hooks. Target fish include swordfish, cod, and halibut.

AT THIS SCALE, A LONG-LINER'S MAIN LINE COULD STRETCH FOR AS MANY AS 175 MAGAZINE PAGES.

HIGH-TECH FISHING

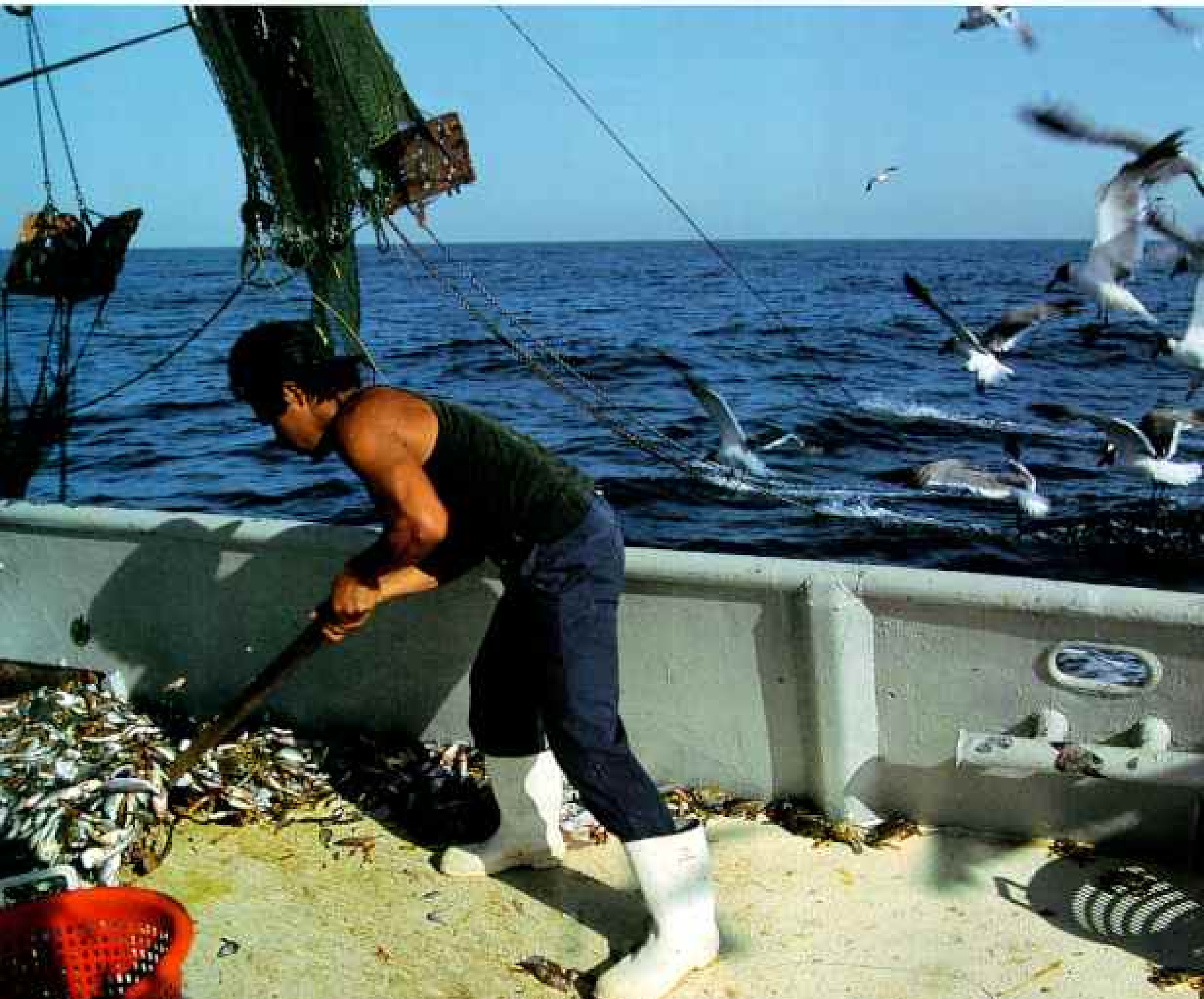
Elaborate sonar arrays allow factory-trawler crews to track the location of fish just ahead of the net. Fish are not so much strained from the sea as herded by the net's cables and wing-like leading edges. Bow sonar and computers automatically steer the ship to larger schools of fish.



ART BY C. BRUCE WOMER

Harvesters of the High Seas

More than a million fishing vessels now sift the world's oceans for seafood—twice as many as in 1970. Yet the global fleet, subsidized for decades by national governments, is poised for a major downsizing. "Many of the small mom-and-pop operations are going to be left behind," says an expert with the U. S. National Marine Fisheries Service. "The trend is going toward fewer, bigger, more efficient boats." The *Alaska Ocean* (above) could be a flagship for this new era of industrial fishing. Based in Anacortes, Washington, the ship can process more than 600 metric tons of pollock a day into *surimi*, the protein paste used in imitation seafood products. At 376 feet she is one of the largest factory trawlers in the world. Once brought aboard (1), the catch is spilled into a fish bin (2) while the half-mile-long net is spooled onto a reel (3). The fish are weighed (4) and then gutted and cleaned (5). Nothing is wasted; offal is processed into fish meal (6) and stored (7). Fish fillets are washed, bleached, and treated with additives (8) before being squeezed into surimi paste (9). Blocks of surimi are then quick-frozen (10) before being boxed and stored in the refrigerated hold (11). To boost morale among 125 crew members, living decks (12) are separated from work decks. Amenities include a brass-trimmed cafeteria, a gymnasium, bathrooms with Japanese soaking tubs, and televisions in most cabins.



(Continued from page 11) Banks of Newfoundland were on the verge of collapse, Canada shut down its own fishery there, putting about 40,000 people out of work. But distant-water trawlers from Spain, Portugal, and other nations—ships like the *León Marco Cinco* and the *Estai*—continue to fish the edges of the Grand Banks just outside the 200-mile limit, which makes Canada angry and distrustful.

That's why, in early spring, I find myself in a spy plane over a stormy Atlantic. We're 250 miles east of Newfoundland, a thousand feet in the air. Below, icebergs and big trawlers wallow in the swell. In the twin-engine plane three men hunch over a radar screen and a computer. The men are watching ships and gathering evidence for Canada's claim that foreign vessels are overfishing here on the edge of the Grand Banks.

Confrontation is brewing. A group of nations tries to administer the fisheries of the northwest Atlantic, but Canada believes that many ships flout the group's rules. So, almost every day, planes like this one fly beyond the 200-mile edge and record every ship they see. Information gathered this way has been used to support Canada's arguments in the UN. But in this little plane, on this turbulent day, it feels more like war.

"Target heading 194 degrees, nine miles," says a voice on the intercom—the radar man reading the direction and distance to a ship. An iceberg passes, blue cliffs indistinct in a snow shower.

"Left three degrees, three miles." A splash of sunlight breaks through clouds and makes the water shine. "Target in sight."

The plane noses into a dive. I can't get it out of my mind that we're about to open fire.

But there's only the clatter of a keyboard. The ship will become one of 32 recorded in the computer today. In the past week, flights have counted more than 70 different ships, all trawlers capable of scooping many tons of fish each day they work here.

We sweep over the ship at about 500 feet. It flashes past on my side of the plane; the cables off the stern straining at the sea as if to draw up a leviathan on a hook. The ship is familiar: Back in January in Vigo I stood right there on that bridge. It is the *León Marco Cinco*. Lazaro Larzabal is still fishing.

Later I meet the prime mover in Canada's war of nerves with the outside world. He is Brian Tobin, the minister of fisheries and oceans. We talk in a hotel room above the stone-circled harbor at St. John's, Newfoundland. Tobin, who will be stuck with fish metaphors as long as he has this job, has been described as a tough guppy: "Small, colorful, and furtive." He doesn't look furtive to me. He looks more like the kind of fish you'd find gnawing cattle down to bones in the Amazon.

I want to know how much further Tobin will go. "Is Canada," I ask, "prepared to use diplomacy by other means?" It's a vague reference to Carl von Clausewitz's definition of war: "a continuation of political relations by other means." Tobin gets my drift.

"For those who operate beyond other rules," he says carefully, "we are looking at diplomacy by other means."

The wasteful wake of shrimping

Netted by a Texas shrimp trawler, thousands of unwanted fish and shellfish are shoveled, mostly dead, back into the sea. Such "bycatch" plagues many fisheries, but along the Gulf Coast a dozen pounds of sea life—much of it juvenile fish—may be sacrificed for a single pound of shrimp (above). "The average bycatch ratio is about four to one," says a federal biologist. Already outfitted to avoid endangered sea turtles, Gulf trawlers may soon be required to reduce bycatch by using modified nets.

He lets the thought sink in, and I wonder if the Canadians will deliver on Tobin's threat.

- NEW YORK CITY—*UN session on fisheries breaks without agreement.*
- NEW ENGLAND—*Fishermen angry at proposed limits on Georges Bank fishery turn over cars and throw fish from a truck.*
- ENGLAND—*Royal Navy officers break into a Cornish fisherman's wheelhouse to arrest him on suspicion of using an illegal net.*
- INDIA—*Traditional fishermen are accused of burning commercial trawlers. A nationwide protest denounces joint-venture fishing agreements.*

LOTS OF FISH HERE, some up in the air. It's spring in the harbor at Dakar, Senegal. Above me bags of frozen tuna, lifted by crane from the hold of a ship, swing overhead, then drop into a dump truck. A second crane lifts frozen carcasses of swordfish from another ship. In a warehouse tuna are stacked to the ceiling. Languages of crews and dockworkers mingle: Chinese, Korean, Spanish, Japanese, French.

In the midst of this industrial bustle, Mbaye Diop, wearing a wisp of beard and a red robe, sits making tea at dockside in an open wooden boat called a pirogue. It's about thirty feet long and eight feet wide. In it baskets hold 1,500-foot coils of line festooned with hooks.

Mbaye Diop is one of the legion of traditional fishermen worldwide who operate from small boats much as their forebears have for generations. Impoverished, they have not been able to share in the technology boom that has made the industrial ships of developed nations so powerful. But Diop and those like him outnumber industrial fishermen about twelve to one.

And they too face declines.

"Sometimes to catch fish," Diop says through my interpreter, "we have to go all the way to the border of Gambia." He grins. I suspect the border is flexible. In today's hard-pressed fishery one must travel farther and farther to get the same catch. Even the poorest fishermen must seek distant waters.

The busy harbor in Dakar reminds me that this is not yet the kind of crisis that makes a hollow sound in the bottom of the boat. Every issue of *Fishing News International* announces the launching of a vast new trawler or an expensive joint venture. Fisheries still feed billions and make money for millions.

Net loss Gathering dust at a Massachusetts fishing store, 25,000 dollars' worth of nets (facing page) are too tightly woven to meet new federal codes requiring larger mesh. Small mesh dooms future fish populations by trapping the small and immature, such as a flounder (above) taken during a raid on a boat using illegal nets on the Grand Banks.

In places where regulators have clamped down—Norway and Namibia, for instance—some stocks are recovering. But these are exceptions. "The fish just get a little smaller each year," a Spanish shipowner with a Belize-registered ship tells me in Dakar.

In the face of such declines neither traditional nor industrial fishermen can turn to voluntary conservation, because there's no profit in it. It just gives the fish to someone less scrupulous. Instead, everyone fishes harder. The hungry, restless, distant-water ships of Spain, China, Russia, Poland, Japan, South Korea, Taiwan, and many others, forced from their traditional grounds by 200-mile limits or by stock declines at home, search the world.

They can be found poaching in Diop's home waters or in those of Gambia, Ghana, Indonesia, the Philippines, or India. Or the industrial fishermen make deals with local governments for access. In the same poor nations traditional fishermen are also fishing harder, while unemployment forces more people to the coasts, where they must fish to survive. Conflict is inevitable.

I find a curious version of this conflict at a village on a beach in Senegal. Here about 500 brightly painted pirogues are pulled up on the sand, temporarily out of action. And just offshore two South Korean industrial ships are anchored. They look huge and ominous in the haze. No one is at sea because the fishermen of this village are arguing with the ships' crews, trying to improve a bad situation.

These Korean ships are part of a weird kind of joint venture. They're called mother ships. Each ship picks up a number of pirogue fishermen, complete with boats, steams to a faraway place where the fishing is better, drops them off—like the Grand Banks dory fishermen of the 19th century—then buys the fish they catch. This sounds mutually profitable, but it isn't.

I ask Bara Sene, one of the local fishermen,

if his neighbors who throw in with the Korean ships catch more than they would at home.

"Yes," he said. "But the price is very low, and the conditions are terrible."

So why would people go with the ships? The answer is familiar:

"The fish are harder to find now."

As the local fishermen argue for better prices from the Koreans, I walk the streets of Bara Sene's village, a mass of tiny homes jammed together at the edge of the sand, right next to a cemetery festooned with nets draped over wooden markers.

I recall something one of the local men told me earlier, his voice proud: "We are the best fishermen in the world, because we start when we are seven." Out by the sea the children play with model pirogues in scummy tide pools where their mothers wash laundry. For these people any decline in fisheries means hunger. Though scenes of famine do not attend this beach yet, it is as threatening on the horizon as those steel ships.

Next morning I learn that the Senegalese fishermen have lost the negotiations. The price will be even lower than the last time they went out. But they can't afford to strike. I watch through windblown haze as they push their pirogues out through rough surf and go to the big mother ships from Korea. Cranes reach down and pluck the boats aboard as casually as if they were logs.

• NEW YORK CITY—*UN negotiators had promised an agreement by summer. None emerges, though a draft with tough enforcement ideas circulates.*

"The voluntary system of regulation of global fisheries has failed," says conference chairman. He speaks of "emerging anarchy in the oceans."

• NEW ENGLAND—*Georges Bank fishermen face new cutbacks; cod and haddock are dwindling.*

• SVALBARD—*Norwegian patrols cut nets of three Icelandic fishing ships in Arctic area claimed by Norway.*

Icelandic ship and Norwegian patrol boat exchange shots.

I'm throwing up into the northwest Atlantic a hundred miles from Iceland. As the Icelandic freezer trawler *Svalbakur* lurches through a late summer gale, I stand miserably on the bridge. The first mate, Beggi Torfason, sits in a chair, wearing jeans and sandals, expressing no sympathy.

"They come in an hour," Beggi says cheerfully. He is talking about fish, as if they were guests arriving for dinner in his net. The ship is fishing for redfish, which will be frozen and sold to—where else?—Japan.

An hour later Beggi says, "They come tonight." But as darkness closes in, the guests do not arrive.

Except for its confounded rolling and pitching, the *Svalbakur* is like any factory. It is clean, tidy, a piece of refined machinery that stretches 220 feet long. Its bridge has so many sonar and computer screens that it looks like an air-traffic control center. At dock the ship looms over buildings; it seems to have been put down among models.

A few guests finally show up, and the *Svalbakur* pulls up its net. The catch is disappointing—only 2 tons in a net that can hold 60. Wearing red suits and helmets, the fishermen struggle on the heaving deck, scant feet from a wet slide into the sea. The net lashes them. A swell surges up on deck and hits one man. For a second he disappears in green water and foam. All I can see is the top of his helmet. The sea drains away. He goes right back to work, lining up the web for the winch.

Watching them work, entirely at home with the willful net and the violent sea, I can understand how scarcity drives the fisherman to work even harder—that's always been his nature. The wild sea is both adversary and home; its energy—and its freedom—are in his soul.

• BAY OF BISCAY—*Spanish vessels blockade several ports during what has become a recurring battle among French, Spanish, and British fishermen seeking tuna. A French fisherman is shot.*

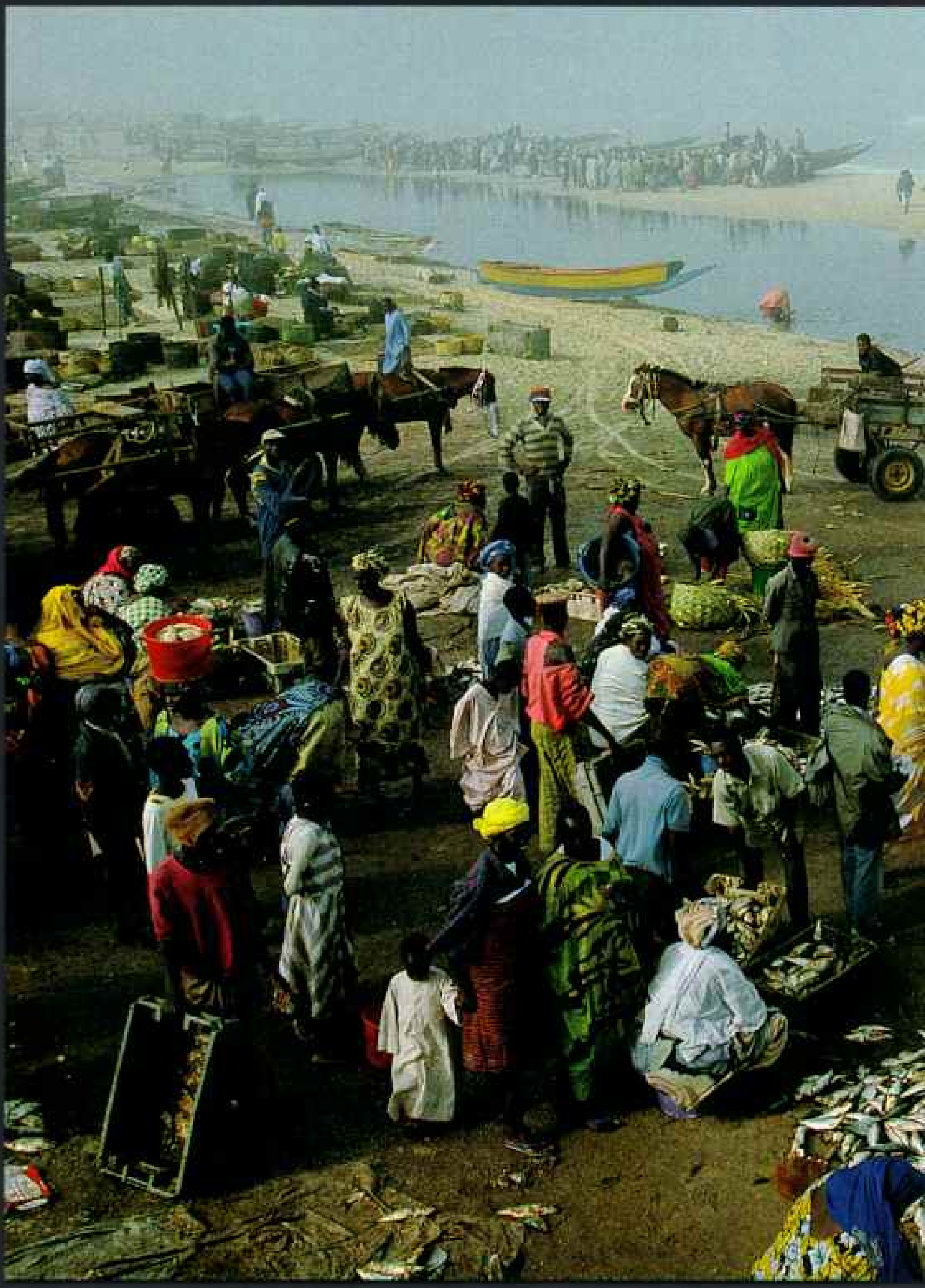
• NEW ENGLAND—*More cutbacks are announced in the cod and haddock fisheries of Georges Bank. Some areas shut down completely, ending an era.*

IT IS FALL, 50 miles east of Cape Cod. Schools of bluefin tuna, huge and fast, hit the surface like bursts of machine-gun fire from below. Above, a dozen planes—each hired by a different boat—hang slow and persistent as mosquitoes, circling in the sky. Down here at sea level, where I am riding in a 34-foot boat called the *Tenacious*, I'm amazed the planes don't *(Continued on page 28)*

SENEGAL

"It is growing harder to survive."

A mean supper in a hard-luck town, a few sardines scrubbed with wastewater will feed a family in St.-Louis, one of Senegal's main fishing centers. Senegal, like other African countries, has opened its rich 200-mile maritime zone to European Union trawlers in exchange for foreign currency. This globalization of the local fishing economy has rocked Senegal's waterfronts. Fish stocks are dwindling, and once independent fishermen now cater to the whims of European buyers. "This," says a Senegalese community worker, "is just the latest battleground between rich north and poor south."



Swapping gossip as well as fish, the beachfront market of St.-Louis bustles with trade beneath a clammy morning haze. Following a generations-old division of labor, men land their laden boats

and turn over most of the marketing chores to women. Today, the best fish are sold to European traders or seafood processors. Inferior fish fill local demand, at an inflated price.

"We can tell by the smell if they have a lot of fish," says one Senegalese of St.-Louis's returning pirogues. Rotting catches have become common as fishermen spend longer periods at sea hunting fewer fish. Families are now separated for days instead of hours (top left). Fishermen also face greater dangers as they motor their open craft (top right) as far as 200 miles to avoid competition with trawlers. Wives, meanwhile, parcel out the dregs of catches, which can't be exported. Torn between the demands of its 50,000 fishermen and a desperate need for revenue, Senegal has taken halting steps to curb foreign access to its waters.

(Continued from page 22) collide. All around us are similar small boats with bow pulpits that look like stingers, moving among the random explosions of fish. They belong to harpoon fishermen, who along with other types of fishermen have a bluefin season of their own.

Harpooning, an ancient tradition, seems anachronistic, but it's one of the most efficient systems of fishing: You select the fish, you kill it quickly, and get it to market the next day.

"Two boats," says a voice from above. It's on a radio speaker, coming from a plane directly overhead. The spotter can see fish out there two boat lengths ahead of us.

Out on our pulpit Skipper Eric Hesse stands silhouetted against the glare, poised with a long harpoon. Like much in fishing, harpooning is an odd combination of old and new—a pyramid of high technology and, at the peak, a man alone with a spear.

"One boat," says the voice from the plane. "Half a boat. . . ."

Hesse's arm and shoulder move suddenly, as if he were cracking a whip. The harpoon shoots into the sea.

From where I stand on the bridge, I see nothing but blue water. Has he missed? No.

"Hit it!" Hesse shouts.

His crewman pushes a button. Hundreds of volts of electricity shoot through a cable into the brass tip of the harpoon. Then, as if made that instant out of sea, sunlight, and the sparkle between, a 300-pound, shining blue-and-silver tuna sweeps to the surface, the harpoon in its back. It's dead.

Reefs in distress

The rattle of an air compressor and the hiss of a breathing tube announce another morning's work on the Philippine island of Palawan, where cyanide is often used in place of hooks and nets. Villagers spray small quantities of the poison into the water to stun fish and capture them alive. Much of the catch is then exported to live fish markets in Hong Kong and to the U. S. as aquarium specimens. Such destructive methods have taken their toll on the species-rich reef ecosystem: Eighty percent of Philippine reefs have been damaged by sedimentation, explosives, toxics, and pollution.

SUCH BLUEFIN are the stars of the sea. "Big as a Porsche, fast as a Porsche, and as valuable as a Porsche," says Michael Sutton of World Wildlife Fund. Like many prized species, the price for bluefin is set by Japanese demand. The record, paid in Tokyo in 1992, was $67,500 for a 715-pound tuna—$94.40 a pound. Fishermen usually get $10 to $20 a pound on New England docks for fish that range from 200 to 1,000 pounds each, but their fishery is in turmoil.

Everyone agrees that bluefin tuna have seriously declined over the past 20 years. But after years of attempts at national and international regulation, no one knows today how healthy the fish stocks actually are. Fishermen like Eric Hesse, whose catch has been regulated by ever shortening seasons, think stocks are recovering; they've seen big schools of giant bluefin at sea when scientists claim the fish are disappearing.

This uncertainty is typical of the slippery nature of fisheries science itself. You can count the numbers of fish caught, but counting wild fish is difficult. Leslie Harris, a Newfoundland fisheries expert, says it is like trying to count cattle by towing a large net behind a helicopter and then extrapolating from what you drag off the range.

Scientists hope for good estimates and luck. Their luck with bluefin has been terrible. Their estimates have been questioned both by fishermen and, recently, by a review panel, throwing the whole situation even deeper into confusion.

On the *Tenacious* all this seems very distant. The sea, the sound of aircraft, the clatter of controversy, all recede in the presence of this

enormous fish. Eric Hesse and his crewman work fast to cut off its head, gut it, and pack it with ice in a plastic-foam box. He'll get $3,500 for it, and tomorrow it will be on a jet for Japan. Out here, far from land, with a big fish on board, sunshine on the water, and a breeze sweet out of the east, this still seems to be a life of freedom on the open sea.

It isn't free, and the sea will not remain open. More limits will come as regulators and environmentalists press for them. The only long-term answer, many say, is to cut back on boats and fishermen.

"Without fleet reduction," says Chris Newton, a former fisheries economist with the UN in Rome, "any management is like going out to dig a ditch with a poker."

But the fishermen will not go without a fierce fight, as I learned one evening in New England at a hearing on bluefin fisheries. All it took was a speaker to gingerly suggest limiting numbers of fishermen. A gray-haired man leaped to his feet, furious.

"Don't go to limited access!" he shouted across the room. "I don't want to be limited! That's not American!"

His words struck me as a cry of loss, and I imagined them rolling out across this world of inevitable limits, to the very edge of the sea.

• NAMIBIA—*After arresting eight Spanish trawlers fishing in its waters in 1991, Namibia is rewarded with a recovering hake stock and a 44-million-dollar joint venture with a Spanish company.*

• WORLDWIDE—*Developing countries hire private companies to conduct surveillance and enforcement of new fisheries laws. These*

companies are zealous: One has proposed to watch over fisheries from a blimp, which could descend to launch a patrol boat.

• PACIFIC NORTHWEST—*Key U. S. salmon fisheries off Washington and Oregon are virtually closed, stocks damaged by overfishing, pollution, and dam building on spawning streams.*

• ALASKA—*The rich fishery for Bristol Bay red king crab shuts down abruptly after a drastic decline in female crabs.*

EAST OF SITKA, ALASKA, in Chatham Strait, an electric motor groans with effort, hauling a longline loaded with fish into the *Cherokee*. It's an old wooden boat and an ancient way of fishing—with line and hooks. But here in Alaska is the future: regulations to the hilt, limits on numbers of fishermen, the end of old freedoms.

The three-eighths-inch line rises from the water, flicking bright drops onto the black surface. Hooked fish come with it into the deck lights, one after another, like twisted fruit on a vine. Turbot. Halibut. Sablefish.

The skipper, in a heavy slicker, deftly flips the halibut and turbot off the hooks (halibut are out of season, so it is illegal to keep them, and there's no market for turbot here) and gaffs the sablefish and shoves them into the hold. Linda Behnken, one of the crew, coils the wet line, her blond hair tucked loosely into a baseball cap.

Behnken, who is active in fisheries politics, is one of those who have brought ultimate limits—a system that makes fishing almost as private as land ownership—to Alaska.

One of the great problems with allowing unlimited numbers of fishermen is that no one owns the fish; they are a resource held in common. In that situation, it doesn't do anyone any good to conserve—the other guy will take the fish you leave. That's why Mbaye Diop, Lazaro Larzabal, and so many others fish harder when stocks go downhill, instead of conserving.

Until this year, two of Alaska's most valuable commercial species—halibut and sablefish—were in that difficult spot. They were managed just like the bluefin in New England: fair game for anyone who could afford a cheap license. As in New England, managers tried to cut back the catch by shortening seasons. But so many people wanted to fish that seasons had to be only a few hours long. On such "derby" days, set long in advance with no way to adjust for bad weather, thousands rushed out to fish like maniacs, to make thousands of dollars each—and sometimes to drown.

Behnken didn't like seeing friends die in crazy derbies and helped persuade state and federal regulators to apply various fishing quota systems to sablefish and halibut.

These systems, used around the world, have many different structures and names. All do basically the same thing—they give individuals limited shares of an overall allowable catch. Shares are usually given out based on what people have caught in the past.

This puts an absolute limit on the numbers of fishermen. Once the quotas are distributed, the only way to get into the fishery is to buy someone else's shares. But it does something else too. If you own a percentage of the catch,

Tapping a marine mother lode

A glistening fortune in sockeye salmon awaits shipment to a processor on Bristol Bay. Making their annual runs in clean, undammed rivers, Alaska's sockeye have remained healthy—a heartening contrast to the emptiness of most lower forty-eight salmon streams.

Biologists say part of this rebound is due to a 1992 ban on pelagic drift nets—so-called walls of death that once snagged countless migrating salmon in the North Pacific. With more modest goals in mind, setnetters try for their limit of sockeye near Alaska's Egegik River.

Salmon armada A seafood company's helicopter scopes out the silty discharge of the Egegik River, where hundreds of boats vie for a share of the 50 million salmon that migrated to Bristol Bay in 1994. In the

fishing frenzy, spawning rivers are closely patrolled. "We use unmarked fishing vessels, aircraft surveillance, even undercover agents working as crew," says a state official.

conservation is now more important to you, because you will reap benefits if the total catch increases.

Individual quotas, however, raise some tough questions. How do you distribute them fairly? How do you keep large corporations from buying them up and taking over the fishery? How do you keep fishermen with limited quotas from "high grading"—wasting fish by dumping all but the most valuable specimens? Is it fair to other Americans to give a public resource away to individuals without a user fee? Behnken and her colleagues have tried to answer those concerns with regulations, but the difficulties of this fundamental change will take years to iron out.

But the freedom? Gone. Over a meal of baked sablefish I talk to Davey Lubin, another Sitka fisherman, who had opposed the new system. He is young, strong, articulate, capable, adventurous. He gives me a whole list of objections to quotas, all of which can be answered by Behnken's arguments. "Aw," he says at last. "I guess I just loved it because it was so *exciting*."

• VIGO—*New joint ventures and new ships proliferate. Spain negotiates to build 50 ships for Cameroon. In Europe some agreements to cut back on ships are being ignored.*
• BEIJING—*China, now the world's largest consumer of fish, buys freezer trawlers, building a distant-water fleet of its own. It already has agreements to fish in the waters of 15 different countries.*
• NEW YORK CITY—*Another UN meeting about the high seas ends without agreement.*
• SPRATLY ISLANDS—*Philippine patrol boats*

End of an open fishery

Wrestling a halibut on board, Scott Hansen hooks a bit of history: 1994 was Alaska's final open season on this coveted flatfish, so eagerly sought after in Alaska waters that fishing seasons were usually limited to just two days.

From now on, however, only a chosen few will be allowed to fish, based on their catch histories in the region. Such quotas concentrate the resource in fewer hands and may be the wave of the future in limiting fleet sizes.

"It was kinda like the last buffalo hunt," says Hansen of last year's frantic hauls.

arrest 62 Chinese fishermen working the disputed waters of these islands west of the Philippines.

THE SKY IS SOFT with warm rain; the sea is gentle. I'm on the island of Leyte in the Philippines. This country's rich coral reefs have been damaged for years by people fishing desperately with things like explosives and cyanide. But there's hope that this is being changed—from the bottom up.

Jose "Joe" Ediczar Ramos and I walk into a village called Balud, by Carigara Bay on the island of Leyte. We cross a plank footbridge over a river estuary. On tidal flats an old man in shorts plants mangrove shoots in mud.

With some general advice from a regional organization for which Joe works, individual villages have been planting mangroves to replace inshore habitat destroyed years before. They have also established marine sanctuaries offshore, where fish can breed, and enforced laws against explosives and cyanide.

The programs give fishermen a sense of collective ownership of individual reefs and fishing areas. And they seem to work.

"Before the sanctuary was established," says the former head of Balud, "most fishermen went home with empty nets. Now they can get as much as 40 kilos in a day."

The village of 120 families is bright with bougainvillea. On a dirt path men stake out short monofilament nets, repairing the web. The mesh is so fine it looks like lace. A lean, middle-aged man named Lorenzo Biasa describes how he used to mix fertilizer and kerosene, put it in a bottle with a fuse, light the fuse and throw it into the water. *Boom!* Dead fish—and dying coral.

I ask him why he stopped. "He doesn't want to be arrested," Joe says with a laugh. Then Biasa adds something. Joe translates: "He says they are no longer innocent about the value of the reef."

In pouring rain Joe and I go snorkeling in the sanctuary. The colors of coral are muted under the clouds. But the place is alive with fish. When we are nearly done, Joe finds a giant clam. It's a *Tridacna gigas*, both valuable and endangered. Its presence is proof of the respect fishermen have for the sanctuary.

Delighted, we float for a while watching the clam, which is more than a foot across. Joe pops up to the surface and speaks to me: "When the sanctuary was created three years ago, that clam was only six inches long." As we talk, the breeze moves us. When we look, the clam is gone. We can't find it again.

I swim back to the boat, impressed by these advances. The only real hope is in the sense of shared ownership that makes responsibility pay. Yet I know that in this bay alone as many as seven ships now fish using illegal night lights, plundering the new bounty the sanctuary makes possible.

As we go ashore, I keep thinking about the way that giant clam showed itself so beautifully, then disappeared, like a promise offered but not yet fulfilled.

• NEWFOUNDLAND—*On March 9, 1995, Canada takes its guns outside the 200-mile limit. From a newspaper report:*

12:50 p.m.: Two Canadian fisheries department vessels and the Canadian Coast Guard ship Sir Wilfred Grenfell *encounter the Spanish fishing boat* Estai. *They attempt to board the* Estai. *Spanish vessel cuts its own nets and speeds away.*

1:40 p.m.: Royal Canadian Mounted Police team attempts another boarding but is turned back by bad weather.

4:33 p.m.: Four bursts of gunfire at Estai. *It stops, and Spanish crew ordered belowdecks.*

4:52 p.m.: Department of fisheries officials and RCMP board Estai *and arrest captain. Ships head back toward St. John's.*

THIS MOMENT has changed the sea. It's the first attack on and seizure of a sovereign fishing ship outside the 200-mile limit.

Seven thousand Newfoundlanders gather at the dock to cheer the arrest. Later, when the captain of the *Estai*—charged with exceeding an agreed international limit on turbot—is taken off the boat, two eggs are thrown. One hits a wall and the other a German diplomat. In Vigo 100,000 people rally, shouting "*¡Viva España!*" I wonder if my old acquaintance Lazaro Larzabal is among them.

The Canadians find a net on the ocean bottom where the *Estai* cut its loose. It has an illegally fine mesh. In the ship's hold are thousands of tiny fish, which means the ship has been catching the young, the last hope for species renewal.

Canada's action stirs ripples elsewhere: Russia announces it will take control of the international waters in the Sea of Okhotsk. When the next UN session on high-seas management starts, Brian Tobin hangs the five-ton net from a crane on a barge for all in New York City to see.

Emma Bonino, Tobin's counterpart for the European Union, is not amused. "The Grand Banks have been turned into some sort of Wild West, with one state acting as the self-appointed lawmaker, sheriff, and judge."

Later, when the UN conference at last agrees on rules to cover international waters, I realize that this craziness of spy planes, patrol boats dropping from blimps, and sporadic gunfire seems as chaotic as the American frontier at the time frontiersmen ran out of wilderness, when law and limits were new.

Until only the past few decades, most of the sea was indeed like the Old West: free, wild, unregulated, a place of opportunity for anyone brave enough to venture out from shore. But declining fish and feuding fishermen prove that the limits of even the grandest piece of the planet—our seas—have been reached.

This doesn't mean the sea is ruined. It's more like a forest than a mine—it will keep producing as long as we don't plunder it heedlessly. But limits mean using restraint, and that's what we don't know how to do yet.

When the Old West was confronted by limits, there was tumult—gunfights, robberies, killings over land and water. Things have settled down considerably, and the same thing will probably happen at sea. But the necessary loss that goes with restraint is profound. Just as the child of the Old West was changed by the passing of the frontier, the next-generation

fisherman will be different. The sea's wild freedom will have gone out of his soul.

That change was already obvious one night in St. John's. I was at a community theater. The stage was festooned with nets. The Grand Banks fishery had been closed down, and a hundred fishermen and fisherwomen had put together a mixed choir from Newfoundland and Labrador. It was called Folk of the Sea.

The Folk of the Sea stood on dry land in green sweaters and sang the songs that had kept their parents and grandparents whole through earlier crises: "Make and Break Harbour," "Drunken Sailor," "Amazing Grace." Behind them the nets and corks looked like artifacts of another time.

The Grand Banks disaster has been called the Dust Bowl of fishing. The Dust Bowl did not kill American agriculture, just changed it.

Fishing for a future

A kerosene lamp, a hand-net, and a frail canoe sustain the hopes of a shrimp fisherman in Ecuador. His quarry? Pregnant females for hatcheries. Aquaculture may slow humankind's drain on marine riches—but can never replace them.

It became big industry: highly regulated, tidy. Thus it may be with fishing. Fish farming, the only piece of world fisheries to show a real gain in recent years, will continue to grow. So will regulation of the sea itself. We will still have fish but not the fishermen we knew. In that auditorium in St. John's, the old life was turning from reality to myth before my eyes.

"Take me back to my western boat," the chorus sang. "Let me fish off Cape St. Mary's."

On stage, one of the fishermen was crying. □

Frozen assets, bluefin tuna worth top yen are readied for Tsukiji's morning auction. The market's clamorous labyrinth of stalls (following pages) showcases all manner of seafood—from live sea eel to pickled octopus—and reflects the well-ordered confusion of Japanese society. Says Tsukiji scholar Ted Bestor, "Tsukiji reveals as much about Japanese culture as it does about Japanese cuisine."

PICKLED OCTOPUS

The Great Tokyo Fish Market

TSUKIJI

TEXT BY T. R. REID
PHOTOGRAPHS BY JAMES L. STANFIELD

The long, cold trip to Tokyo came to an end for tuna number 197 with a *thud,* a *bonk,* and one last cavernous *clunk* as the huge fish toppled off the truck and skittered across the slippery concrete floor. Two, maybe three days earlier, this torpedo-shaped bluefin had been searching for its supper in the chilly waters off Boston. Now—netted, gutted, flash-frozen to 76 degrees below zero, and transported via cargo jet halfway around the world—197 was itself on the verge of becoming somebody's supper, served up on the polished wooden counter of a sushi bar where diners would pay $11 an ounce for this succulent delicacy.

The place that transformed 197 from just another fish in the sea to one of the world's most expensive foodstuffs is a sprawling, teeming, cacophonous corner of reclaimed land on the edge of Tokyo Bay. Its formal name is the Tokyo Central Wholesale Market, but in Tokyo everybody calls the place Tsukiji (pronounced skee-jee), for the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neighborhood where the market stands. Fairly substantial quantities of meat, mushrooms, maple syrup, pickles, potatoes, peaches, and other foods move through this market every day. But the heart and soul of Tsukiji is fish.

Tsukiji is a fish market in the sense that the Grand Canyon is a ditch or Caruso was a crooner. Among the wholesale fish markets of the world, Tsukiji ranks at the top in every measurable category. It handles more than 400 different types of seafood, from penny-per-piece sardines to golden brown dried sea slug caviar, a bargain at $473 a pound. It imports from 60 countries on six continents—indeed, the list of shipments reaching Tsukiji on any given morning reads like a verse from John Masefield's poem "Cargoes": eel from Taiwan, sea urchin from Oregon, octopus from Athens, crab from Cartagena, salmon from Santiago, tuna from Tasmania, and on and on for hundreds of entries. Tsukiji moves about five million pounds of seafood every day—seven times as much as Paris's Rungis, the world's second largest wholesale market, and 11 times the volume of New York City's Fulton Fish Market, the largest fish market in North America. In dollar terms, that comes to 28 million dollars' worth of fish. Per day.

Handling that incoming ocean of seafood is the work of some 60,000 people and a fleet of 32,000 vehicles that seem to operate in a near-constant state of gridlock. At the midpoint of Tsukiji's workday (6 a.m. or so) the crowded sheds and narrow passageways are so clogged with trucks, vans, motorcycles, forklifts, handcarts, and bicycles (with the rider balancing, say, four cases of live shrimp on a shoulder) that you literally can't find walking space.

Not that it's safe just to stand still—if you do, there's always the risk of being mowed down by a *ta-ray*, a three-wheel, gas-powered wagon that zips through the market carrying stacked cases of fish.

The first couple of times I went to Tsukiji, I was overwhelmed by the vastness of the place, the frenzied activity, the constant roar of voices and vehicles. I was struck both by the presence of so many fish and by the mysterious absence of any fishy aroma (it's actually no mystery at all, I learned later; the produce sold at Tsukiji moves through the market so fast that it's long gone before it starts to smell). I remember wondering—as I stepped over long rows of tuna, walked past blue plastic trash cans filled with squirming eels, slipped between stacked wooden cases of flounder flapping their tails—how any city could eat this much fish in a month, much less one day.

But going back more often, I gradually realized that to focus on the bigness was to miss a key point. The real secret here, the reason the place does its job so well, is that Tsukiji is a small town. It's a community where everybody knows everybody else, and everybody works together toward the common goal of moving fish as fast as possible from the sea to the sushi bar or the supermarket.

"Of course, we know that time is money," says white-haired Kikuo Takayanagi, president of the wholesale firm Daitoyo and a respected elder statesman of the marketplace. "Even so, you always take the 30 seconds to bow, to say hello. We are all neighbors here."

"To understand how Tsukiji works, just remember that Tsukiji is a *mura*," smiles Makoto Nozue, director of the Tsukiji Tuna Association, using the Japanese word for a traditional village. "We feel we work in a community called

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T. R. REID is a reporter for the *Washington Post* and its former Tokyo bureau chief. He reported on the Kobe earthquake in the July issue. JAMES L. STANFIELD last photographed Fiji (October 1995).

Tsukiji-mura. Yes, we are all competitors. But we spend a lot of our lives in this crowded village, and we need to get along."

Like every Japanese mura, the small town called Tsukiji has a clear hierarchy. At the top of the pecking order are the employees of the seven major first-tier wholesalers, who buy up fish around the world and get them to Tokyo. The big seven, in turn, auction off the daily catch to more than a thousand middle wholesalers, who cut, package, and deliver the goods, sometimes to yet another tier of distributors, sometimes directly to stores or sushi bars. There is a separate world of small businesses—knife sharpeners, boxmakers, bootsellers, and three dozen restaurants—on the site to serve the fishmongers.

And yet the privileges of status at Tsukiji tend to yield to the fundamental Japanese social principles of harmony, community, and the avoidance of confrontation. I saw that one morning when I witnessed a traffic accident in the market. A rampaging ta-ray cart slammed into a bicycle. The biker was wearing the uniform of one of the seven top-tier firms; the

While Tokyo slumbers, Tsukiji hustles as trucks deliver five million pounds of seafood—enough to satisfy the region's tens of millions of fish-eaters for a single day. Tsukiji's stylized logo (facing page) translates simply "fish riverbank," but merchants tout the 56-acre megamarket as *Tokyo no daidokoro:* Tokyo's pantry.

Hawking the World's Costliest Fish

A torrent of transactions wrings sweat from auctioneer Masami Eguchi, who sells 200 tuna in half an hour, or about one every nine seconds. "I have to recognize the highest bidder instantly," Eguchi says. "No delays are allowed." Casting sidelong glances like high-stakes poker players, silent buyers signal bids for numbered tuna with hand gestures. By fingering slivers of flesh beneath a flashlight, bidders discern subtle distinctions in fat content and color, key selling points that sway the price of a premium tuna from $6,500 to $11,000—and up.

DAVID DOUBILET (ABOVE AND TOP)

ta-ray driver, who worked for a small wholesale outfit, seemed to be in the wrong. But it quickly became clear that this incident would be resolved by the Japanese version of a no-fault settlement: Both drivers got off their vehicles, took off their caps, bowed deeply to each other, apologized, and then worked together to straighten the bicycle's bent fender and to gather up the cases of fish sent flying in the crash.

Like every Japanese mura, Tsukiji has its own Shinto shrine, a handsome dark-wood structure with a black fluted roof and an imposing 12-foot-tall *torii*, or gate, out front. It was built here 350 years ago, when the ruling shogun first reclaimed the land, to appease the gods; that explains its name, Namiyoke Inari Jinja, or "hold-back-the-waves shrine."

"People in the fish market come to pray more often than the average salaryman," the amiable chief priest, Hidemaro Suzuki, told me one day as he sat cross-legged on the tatami floor of his shrine. "They are buying and selling every day in auctions, and auctions are a function of fate. So people working here need more contact with the gods."

Sometimes the shrine is a place for carefree escape, such as the festival each June when hundreds of fish-market people pull on bright orange *happi* coats for a grand procession through the neighborhood. Sometimes the shrine is for contemplation; several times a year Suzuki-san leads prayers for the fish that die here. Gathering up his long black kimono, the priest led me over to a large rock in the temple garden, placed by the Association of Sushi Suppliers. "We have pleased many

Wielding a sword-long knife, fishmonger Motojiro Nakata halves a bluefin purchased at the morning auction. Thinly sliced and served with other raw delicacies as sashimi, the translucent flesh delights the eye as well as the palate. Japan's craving for such fare incites relentless fishing—and concerns about dwindling bluefin stocks.

DAVID DOUBILET

humans with fine sushi," the inscription reads, "but we must also stop to console the souls of the fish."

TSUKIJI puts heavy emphasis on education to pass along essential skills to the next generation—yet another resemblance between this place and Japan's small towns. On any given day there will be classes at the market on topics like auction protocol, knife handling, or time-tested techniques for making a spicy *kamaboko*, or fish sausage.

One day I happened upon a course that had literally life-or-death implications. Officials from Tsukiji's Fugu Harmonious Association were teaching the proper way to carve a fillet of *fugu*, the bulbous fish usually known in English as blowfish or puffer. For reasons I've never understood—the stuff always tastes like cardboard to me—fugu is an expensive and cherished delicacy in Japan. Unfortunately, it can also be lethal. Enzymes in organs of the fish are fatal to humans; almost every year some unfortunate diner expires in Japan after feasting on fugu that was not properly prepared.

Accordingly, a national license is required for every fugu chef. The class I saw was preparing candidates for the rigid licensing exam. "I've only got a month to go before the test," 26-year-old Kazuya Yawatagaki told me nervously, hefting an 18-inch knife as he practiced cutting slivers of fugu so thin they were translucent. "There's a written exam that lasts two hours. The next day they hand you a fugu, a knife, and two pans. In 20 minutes you have to put every poisonous part of the fish in one pan and all the edible parts in the other."

Another reason the people of this teeming place see themselves as neighbors in a village is that everyone in the market is bound to an upside-down daily schedule known as Tsukiji time. The market's workday begins just before 3 a.m., when the truck convoys begin to arrive, hauling fresh and frozen fish from around Japan and around the world. By sunrise it is time for the lunch break. When the day's work is essentially done, the people of Tsukiji sit down for dinner and a cold beer—at around 8:30 in the morning.

"Someone working here might live in a nice neighborhood like Shibuya or Funabashi, but how can you have

Forging a Fishmonger's Knife

In a cuisine that emphasizes raw ingredients artfully presented, knives hold special value. (The Japanese word for chef, *itamae*, literally means "in front of the cutting board.") At his forge in the city of Fukui, bladesmith Masaji Shimizu produces the five-foot-long *maguro-bocho*, or tuna knife, prized by Tsukiji's tuna dealers. The painstaking process entails heating iron and steel bars to a malleable 900°C, then fusing the two metals under a power hammer (above). The blade is honed on a grinding wheel amid a shower of sparks, then scrutinized for flaws. About one in three are rejects, says the second-generation knifemaker. "But I am getting better."

any friends there?" says Masami Eguchi, a round-cheeked, crew-cut 41-year-old who has worked at Tsukiji for 20 years. "You get up at, what, 2:30 a.m. to go to work, and when you get home, you're already thinking about going to bed. So for us, our 'neighborhood' is really Tsukiji."

As a rising star in the ranks of Chuo Gyorui, the largest of the seven first-tier wholesale firms, Eguchi-san says he has no complaints about his inverted workday. "But my daughter is four now, and she's starting to complain," he adds with a half smile. "She says, 'Papa, you're a grown-up! Why do you go to bed before I do?' "

Eguchi-san needs his sleep, because around five every morning he plays a leading role in Tsukiji's most lucrative daily drama: the tuna auction.

LONGER THAN A MAN and weighing from 200 to 1,000 pounds each, hundreds of tuna arrive in Japan by cargo jet every day. So voracious is the Japanese appetite for fish that even the swordfish caught by a tourist off the coast of Florida is more likely these days to end up frozen in Tsukiji than stuffed on the fisherman's wall; Chuo Gyorui and other first-tier wholesalers contract with agents on the charter docks in Miami to buy those big prizes as soon as they reach shore.

From the airport, the tuna are trucked to Tsukiji and bounced out onto the floor of the big tuna shed. They are lined up in long rows, like so many toppled bowling pins, while workers weigh them and label them with bright red characters. Number 197—a monster of a fish at 622 pounds—happened to be the 197th tuna delivered to the Chuo Gyorui auction area the day it arrived; the man with the writing brush quickly stroked the essential information on the tuna's belly: #197, Boston, 282 kg.

In the crowded market the frozen fish quickly begin defrosting, and a cold, eerie mist rises from the long lines of tuna. Around 4 a.m. an army of phantom figures starts moving through the mist. These are the buyers from several hundred second-level tuna wholesalers, who cut a morsel of dark red meat from each tuna; they feel it, smell it, check its color and oil content, constantly making notes on their hands or scraps of paper.

Eventually, the auctioneers join the throng. Proudly putting on his brown-and-white Chuo Gyorui cap, Eguchi-san sets up shop on a small wooden pedestal, ringing his handbell to announce the start of the sale.

"There are dozens of auctioneers working for the big seven wholesalers," Eguchi-san explained to me one day. "And each one has his own chant, his own rhythm. You have to pick a style that works for you and for the buyers. And you have to work fast. You know, the tuna I sell go for 600,000 yen [$6,800 U. S.], even one million yen apiece, and I have to sell 200 of them in about half an hour each morning."

Eguchi-san's style of selling might be described as "total involvement." With his right arm high in the air and his chubby belly bouncing rhythmically

The lunch-hour rush hits at dawn inside Tsukiji's three dozen eateries, where workers relish such fresh-caught fare as horse mackerel grilled over charcoal (above). Fish has long been the protein staple of seagirt Japan, which consumes more than a tenth of the world catch.

Smell is the surest test of freshness, says buyer Yoichi Kitahara, sizing up a handful of *shirasu*, or dried young sardines. On the accepted, though naive, notion that women's hands are warmer than men's and thus more apt to lessen peak freshness, few women sell fish at Tsukiji. Handling money and ledgers instead of fish, Yoko Fukaizawa (below right) begins her workday with prayer.

along, he roars out his sing-song call. He constantly scans the arcane hand signals of the buyers circled around him, stepping up the pace, and his own rate of bounce, as the bidding goes higher. When one fish is sold, he swipes quickly at his sweat-soaked face with a sleeve or handkerchief and moves on to the next without missing a beat.

Implicit in this complex ritual of inspection and auction is a concept that might not be immediately obvious to Americans—one that I was educated about over an exquisite dinner of tuna sashimi when I asked Eguchi-san's boss, Hiroyasu Itoh, senior managing director of the Tuna Department of Chuo Gyorui, if all tuna taste alike.

Itoh-san, who has put in some 40 years with his firm, bore my ignorant query with a gentle smile, and replied with a question of his own.

"Reido-san," he said, "why is it that Americans think any fish is just like every other fish? They're not made in a factory, you know. It seems perfectly obvious to us that a bluefin from the cold, rough seas around Tasmania will have different meat than a bluefin from tropical waters. I guess if you cook your tuna with lemon and seasonings, then it all starts to taste the same. But that's another thing I can't understand."

Itoh-san deftly scooped up a slim rectangle of deep red tuna meat with his chopsticks and held it out to me. "Why would you take fish this good, fish that cost 7,000 yen a kilo [about $36 a pound], and cook it? I mean, you kill the flavor! It seems so wasteful."

In fact, virtually all the tuna and more than half of all the seafood Tsukiji sells each day will be eaten raw—either sliced into small rectangles as sashimi or placed as the topping on a cube of sushi rice. And it will all be expensive.

Japan is famous for outrageous prices, of course, and the country's famously inefficient distribution system is a key reason. This is all part of Japan's basic social contract: To make sure that almost everybody has a job, extra layers of labor are added to virtually every economic activity. This is costly in terms of prices, but it also saves a good deal of money, pain, and disruption by ensuring a secure and peaceful population. As the central seafood distribution hub for a nation of fish lovers, Tsukiji vividly illustrates how this works.

Consider, for instance, tuna 197. It was caught by an American fishing boat. Sold to a Japanese trading company. Shipped via air and truck to a first-tier wholesaler at Tsukiji. Sold at auction there to a smaller Tsukiji wholesaler. Cut, packaged, and transferred to various distributors. Delivered to restaurants throughout central Japan. By the time the fish finally got to the end consumer, tuna 197 had passed through at least seven intermediary companies, each one taking a profit along the way. No wonder some salaryman in a sushi bar ended up paying five dollars or so for each half-ounce bite.

BUT IF TSUKIJI serves to prove the common Western view that Japan is expensive and inefficient, it tends to undermine another piece of conventional wisdom about Japan—that its markets are closed.

Almost every developed nation is running a trade deficit with Japan, and companies around the world still face problems getting many goods and services into this rich country.

But when it comes to food, either from land or sea, Japan is the biggest net importer on earth. Tsukiji, of course, is the biggest importer of seafood, and people working in the market seem proud that their daily labor helps offset Japan's big trade surplus.

"You know, Bill Clinton ought to give me a medal," laughs Tetsuya Ishizaki of Chuo Gyorui, a man who greeted me wearing an orange plastic squid in place of a necktie. "I mean, President Clinton says he wants Japan to import more American products. Well, I get up at three every morning to buy American imports."

The import that Ishizaki-san brings in from California, Oregon, and Maine is *uni*, or sea urchin, a fist-size shellfish with a buttery soft meat of yellow, red, or bright orange. Many Americans probably wouldn't know a uni from a unicorn, yet the U. S. has become the biggest exporter of uni on earth. And every last exported uni goes straight to Japan.

"I went to Portland, Oregon, to teach them how to get the uni out of the shell and into the wooden shipping box," Ishizaki-san says. "The California red sea urchin is one of the largest uni in the world, and it is delicious. But we had to explain to the Americans that if you handle the meat too much, it will go bad."

The reason that Tsukiji buyers had to develop a U. S. uni industry involves a familiar problem in the fishing business these days. The uni-picking grounds in Japan and Korea have been overfished, and it is necessary to give them time to replenish. Japan has sharply limited uni picking in its waters—they can be fished no more than two hours a day—and other countries (as well as California and Maine) are moving in the same direction.

The sea urchin is hardly the only marine species facing depletion, and many people at Tsukiji are coming to sense a tension between the desire to sell as much fish as possible today and the need to have more fish available to sell tomorrow. "We all think about this," says Itoh-san, the 40-year veteran of Chuo Gyorui. "My father was in this company, and I would like for my children and grandchildren to have a future in it. And that means we must have healthy fish stocks."

The need for healthy stocks around the world will continue, because the world's biggest fish market must continue to sell fish. Its appetite is huge, and its reach is broad. In almost any corner of the seven seas, buyers from Tsukiji are at work right now, on the lookout for tomorrow's number 197. □

Real-life Moby Dick Sighted off the Azores in the North Atlantic, an extremely rare 13-foot-long white sperm whale calf swims with an adult. Though photographer Nicklin could not determine whether its eyes were pink, the calf appears to be a pure albino. A white adult, possibly one of its parents, has also been seen.

THE REALM OF THE ELUSIVE SPERM WHALE

By HAL WHITEHEAD
Photographs by FLIP NICKLIN

Quality time in the Galápagos After hours of foraging in the depths for squid and fish, female sperm whales and their offspring gather at the surface off Pinta Island for what researchers believe

is a daily period of socializing. Unlike baleen whales, which form only temporary bonds, toothed sperm whales live in extended family units that for females constitute lifelong associations.

SOME DAYS the sperm whales seem so few and the ocean so vast. That's when I try to remind myself of all the times here in the calm, equatorial waters off the Galápagos Islands when I have sailed alongside as many as two dozen sperm whales, their bodies massed on the surface like a raft of logs. But sooner or later, as on empty days like this, I am convinced that I will never see another whale. For three weeks I have wound among volcanic islands searching for one of the 200 or so whale families that live in this patch of the Pacific off the coast of South America.

A hydrophone trails behind my 40-foot cutter, *Balaena*. In the old days Yankee whalers strained their eyes at the horizon, watching for the blow of a giant sperm whale. Nowadays we hear sperms long before we see them. Belowdecks I sit with headphones on and strain to detect the telltale *clickclick* of a whale hunting by sonar. What I hear are the squeals and whistles of dolphins that are leaping alongside us, but not a single whale click.

Then late one afternoon: "You'd better hear this," calls out crew member Sascha Hooker. What she hears is an intense pattering, like radio static. It is the sound of many, many whales.

Trimming our sails, we follow the jumble of clicks toward Pinta Island and its stark volcanic cone. Before long my crew and I are crowding the decks, beaming, as some 50 sperms carpet the ocean. Finally our work can begin.

Since 1985 I have sailed every two years in the Galápagos. This year I voyaged the entire 4,000 miles from my home in Nova Scotia, Canada. I am accompanied on most trips by my wife, Lindy Weilgart, who studies whale acoustics, and lately by our three children, who range in age from eight years to four months. I am also joined by several graduate students from Dalhousie University, in Halifax, where I teach.

We come to study the social lives and groupings of the sperm whale, the world's largest toothed whale. With numbers into the hundreds of thousands, they may also be the most populous of the large whale species. Arriving for the height of the mating season in April and May, we regularly travel by sail with our auxiliary engine off to save fuel and hear the animals better. At sea for two- to three-week periods, we find whales on the hydrophone and then follow the families for several days at a time, adapting our rhythm to that of the restless, feeding creatures.

Except for a few young males, all the whales now spread out before us are females, the adults 28 to 38 feet in length. What my research has shown is that sperms, unlike the large baleen whales, usually live in schools of between 10 and 15 female adults and their offspring, most of them genetically related. This female-centered society is strongly cooperative, and calves appear to be raised communally. Bonded for life, females rarely stray far from their tropical and subtropical breeding grounds. The Galápagos population probably keeps within a 600-mile range of the islands.

Males lead much more solitary, nomadic lives. We now believe that young males leave maternal pods at about age six, when they are about 25 feet in length. They migrate to cooler seas, where they form very loose-knit bachelor schools such as one being studied off Kaikoura, New Zealand, by Stephen Dawson and Elisabeth Slooten of the University of Otago in Dunedin.

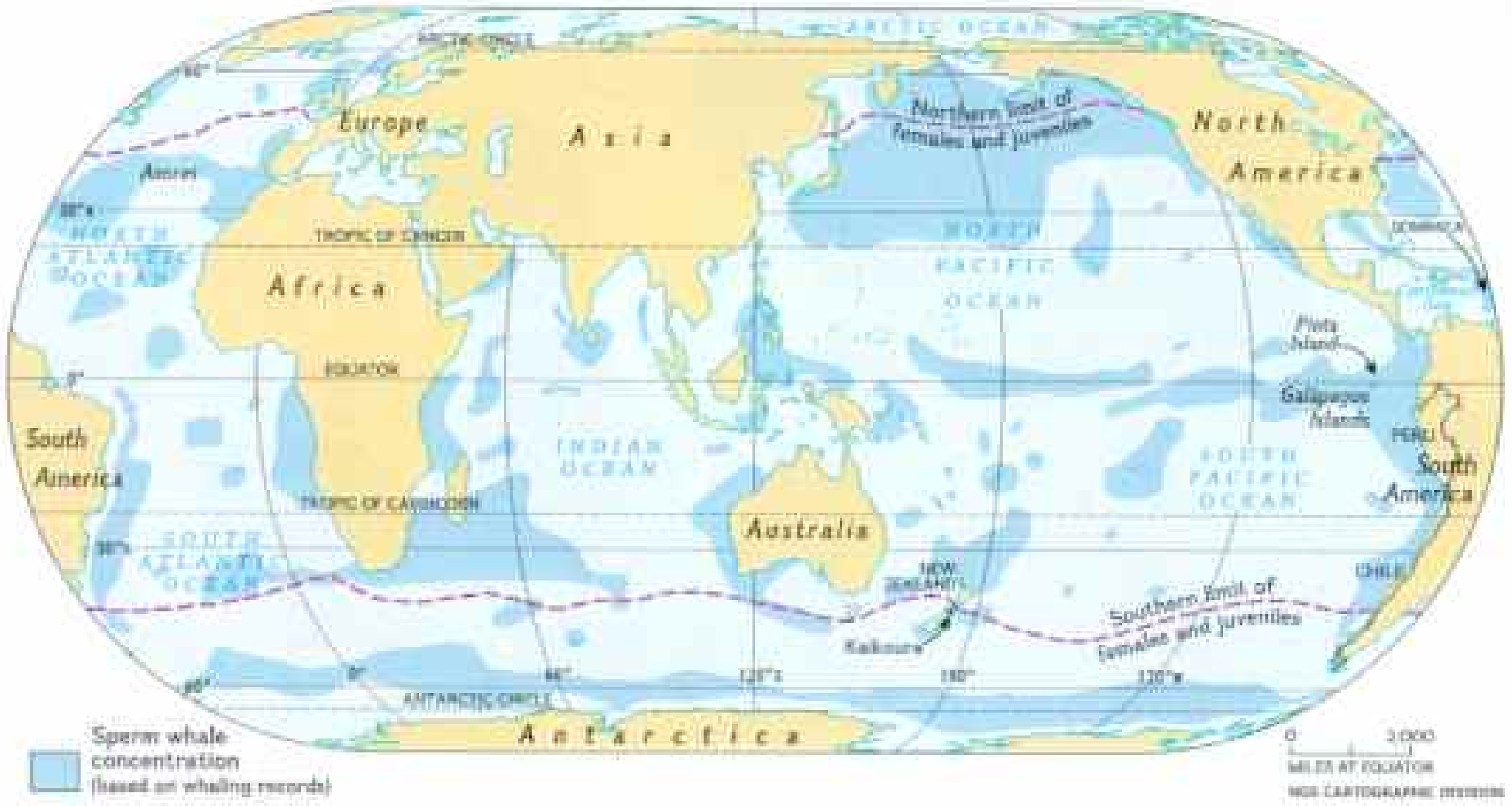
The largest bulls, nearly 60 feet long and weighing 60 tons—the size of Moby Dick in Herman Melville's famous novel—end up alone, often roaming the edges of the pack ice in both hemispheres. The bulls probably isolate themselves so they can satisfy their huge appetites with a minimum of competition, returning to warmer waters only to mate.

The highly social females are more rewarding to study. Once we had discovered where the whales were congregating off Pinta Island, we picked out a group of 11 individuals, most likely members of the same family. The youngest was about two years old. Tracking their cacophony of clicks, we began our round-the-clock grind of data collection. Our busiest time comes when the whales dive and their tails lift above the sea. Few dives go unphotographed. By studying the nicks and scars on tail flukes, we have been able to identify some 1,500 individuals, or half the local population.

The cows spend most of each day feeding on squid and fish in the deep world below. Tracking the whales by sonar, we envision them sweeping along in broad formations at 1,300

A native of England, HAL WHITEHEAD has previously written about sperm whales in the Indian Ocean (December 1984). His collaborator then as now, FLIP NICKLIN exhibits a career's worth of photographs in a new Society book, *Whales, Dolphins, and Porpoises*.

Hard science, soft love Shouldering the duties of father and expedition leader, author Hal Whitehead is up at dawn cuddling daughter Stefanie and helping Jenny Christal log minute-by-minute observations of sperm whales (below) off the Galápagos Islands, home waters for some 3,000 whales. One of the first scientists to travel with sperms for weeks at a time, Hal and crew use a sailboat to stay with the animals night and day, tracking them by the clicking sounds they emit when hunting or socializing.



The sensitive type A male adult nuzzles up to a female adult and several young at breeding grounds off Dominica in the Caribbean Sea. Herman Melville, in his 1851 epic, *Moby Dick*, cast the sperm whale as a creature of "great ferocity, cunning, and malice." It's a bad rap, say today's field researchers. "Sperms are very timid," says Whitehead. "I've seen a harmless fur seal scare off a whole group of them."

feet or more, staying down for an average of 40 minutes between breaths.

The closeness of the sperm whale family was on display each day, usually in the afternoon, when the members broke off from hunting and gathered for extended socializing. They would collect on the surface, sometimes lying nearly still, at other times swimming slowly or rubbing up against each other. The steady stream of hunting clicks would subside, and new, shorter cadences would pass between them.

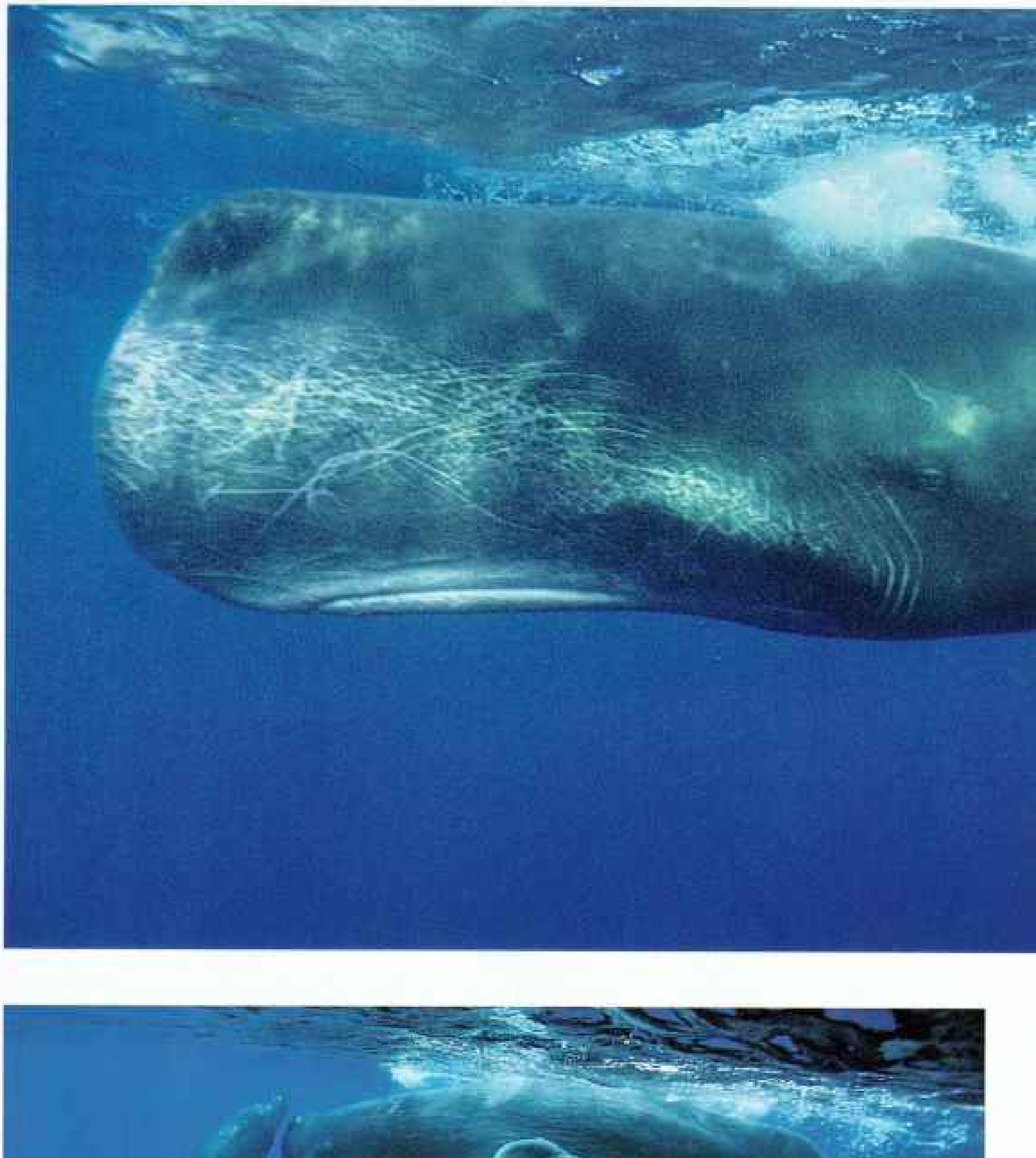
These Morse-code-like patterns, known as codas, appear to represent a system of communication unique to sperm whales. Lindy has identified 23 distinct codas used by the Galápagos population during social interludes.

"A regular five-click coda often begins conversations, like a 'hello,' " she says. "Seven-click codas tend to follow those with eight clicks." Trying to decode the meanings of the codas, Lindy says, "is perhaps the most fascinating puzzle today in sperm whale biology."

Bulls announce themselves with a clang, or what we call the Big Click. Repeated every seven seconds, it sounds like a jail door being slammed and may attract females or intimidate other males. It was long assumed that bulls attached themselves to a single family of females. Our observations have helped toss out the harem theory. Just like male elephants, bull whales rove singly among families of females, spending only an hour or so with each as they search for receptive mates.

Seeing a big male is always cause for celebration because we see so few—only five to seven a season. During the 1960s and '70s, whaling fleets killed tens of thousands of male sperms, partly for the oil in their large head cavity, highly valued as a machine lubricant. The slaughter was particularly intense and prolonged in the waters off Peru and Chile to the south of the Galápagos. Though commercial hunting of sperms ended worldwide in 1988, the harmful effects linger, especially in the Galápagos with the disturbing shortage of adult males and young calves.

We never heard a male's clang as we followed the pod. But we were content simply to move with the whales, feeling in touch with their intimate society. I felt closest at night, while the rest of the crew slept and I sat alone at the helm on my watch. Under the stars, with the sails full, the water glowing with phosphorescence, I listened for hours to their clicks and blows. They were leading the way, and I was happy to follow. * * *



Return of the lonesome male

Twenty tons of male sperm whale glides past a filmmaker in the clear waters off Dominica. Like elephants and great apes, sperm whales are sexually dimorphic—adult males dwarf females, particularly because of their massive, blocky heads. Much of the head in both sexes is reserved for the spermaceti organ, a conical sac filled with fibrous gel. Researchers guess that its function is to transmit and amplify the whale's powerful clicking sounds. Whalers in the past hunted sperms for the high-quality oil in the head—as much as 500 gallons in a mature male.

Males lead segregated lives. Around age six they leave the family unit and migrate to colder waters, where they live alone, occasionally traveling in small schools. Not until the age of 27 or so do they return to warm waters to breed, and then only temporarily. There they may clash with rival males, as evidenced by teeth scars on their foreheads. Sperms may live as long as 70 years.

Jonathan Gordon, who conducts research in Dominica for the International Fund for Animal Welfare, expected some violence when a male confronted a resident family. Instead Gordon was astonished to find that "all the whales seemed delighted to see the male. They rubbed and rolled along his body." Flip Nicklin captured the rarely photographed interaction (left), approaching as close as 15 feet to the preoccupied giants.

Age of innocence Left alone near the surface while its elders hunt far below, a 15-foot calf with sloughing skin makes a pass in front of photographer Nicklin. "Most times sperm whales look like

boxcars with tails," he says. "Here I could finally focus on the eye."
Adults have been known to stagger their dives so one is nearby to
defend a calf against sharks or killer whales.

An upside-down audience of whales

Being stared at by sperm whales was a novel event for Nicklin. "I was snorkeling on the surface when the whales showed up 50 feet below me. They turned over and floated belly up for 15 minutes sending out sound waves to echolocate me. I could *feel* them looking at me."

The unorthodox posture principally aids vision. Right side up, the whales' upward vision is restricted by their bulky heads. By turning over, the whales could use both eyes together, improving their depth perception.

Nicklin saw the whales easily from the vivid outline of their lower jaws. The white skin coloring probably plays a role in visual communication between group members.

Sperm whales are usually heard but not seen. Counting whales, researcher Jonathan Gordon (below) listens hard to a hydrophone. If he hears a loud clang, he knows a big male is somewhere near.

Young males have one thing in mind—eating

A whale's tail seen from the side does a slick job of impersonating a sea serpent before an audience of clicking humans in New Zealand waters. One of the prime whale-watching locales in the world, the cold waters off Kaikoura, site of a former whaling station, support some 80 sperms, almost all of them males in their mid-teens to mid-twenties. Although they are sexually mature, or close to it, they are not yet socially mature, a development that seems to occur in middle age. Such maturity signals a male's readiness to undertake the long journey to warmer waters to mate.

According to research by Stephen Dawson and Elisabeth Slooten of the University of Otago in Dunedin, New Zealand, males come here to feed in an offshore canyon. It is not a clubby scene; males rarely interact, either on the surface or at hunting depths of 1,500 to 5,000 feet. Aggression between young males seems nonexistent.

Though the New Zealand males are enormous animals, averaging 35 to 45 feet in length, often all that's seen of them is their rumpled backs with the distinctive asymmetrical blowhole on the left tip of the forehead (right). Beneath the blowhole is the whale's powerful sound-making mechanism, a pair of lips that clap together when the animal blows air through them. Such is the force generated that the sounds can be heard five miles away.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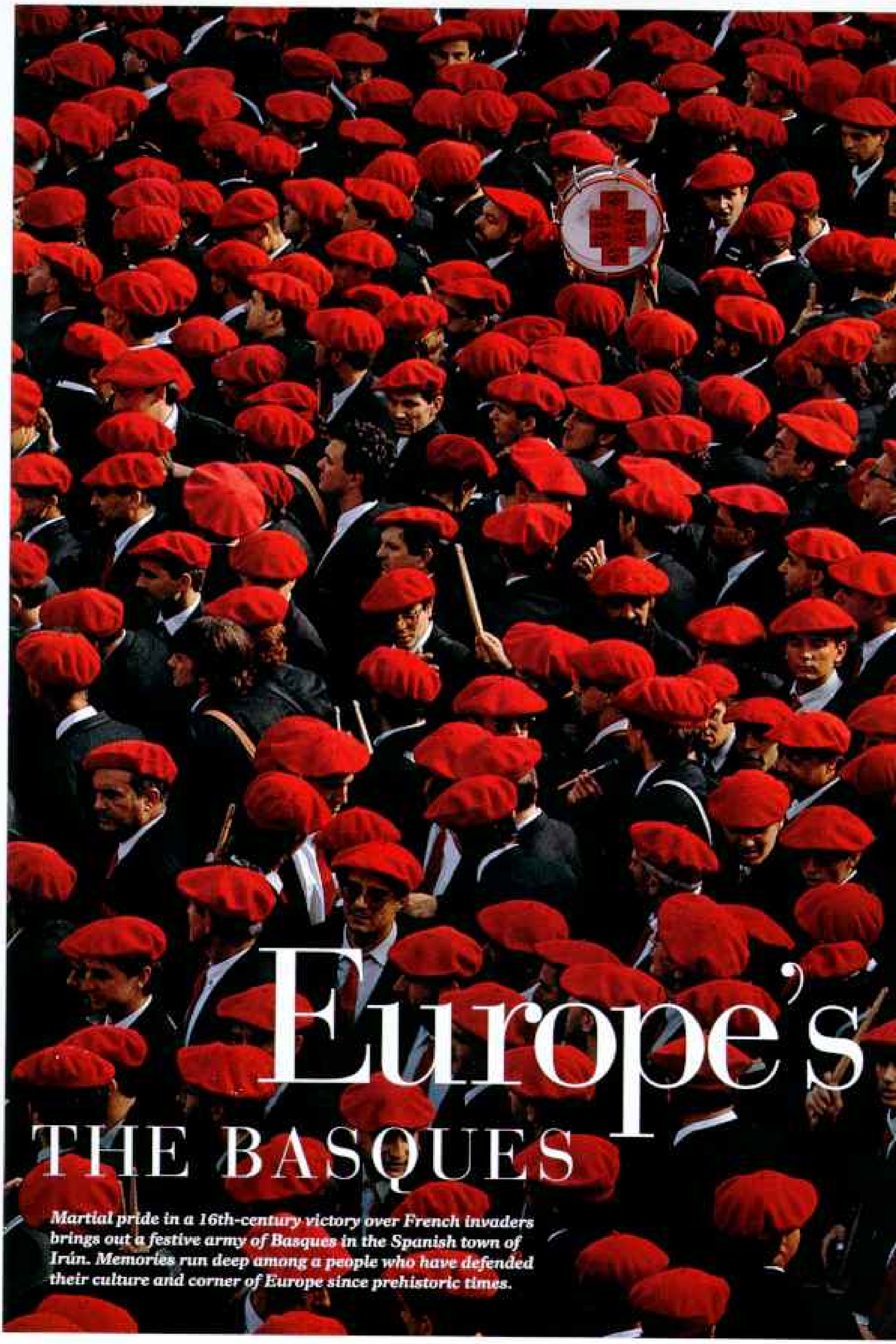
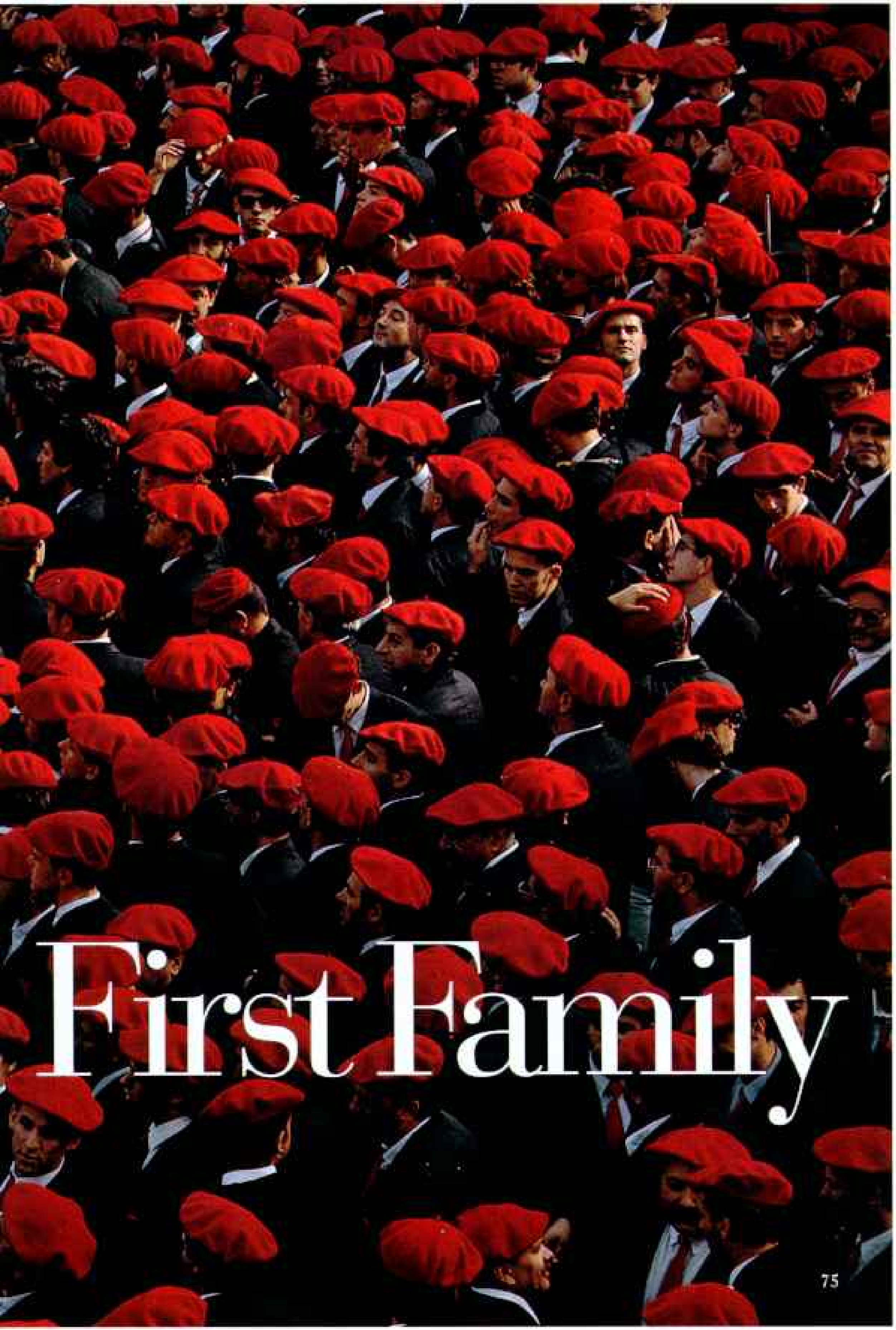
Sign of the whale Nicks on a 12-foot tail are the identifying marks researchers use to monitor a deep-diving male off New Zealand. Perhaps the most plentiful of the great whales, sperm

whales still suffer from a shortage of adult males, victims of the modern hunt, ended in 1988. When this male graduates to the breeding grounds, whales and whale lovers alike can rejoice. □

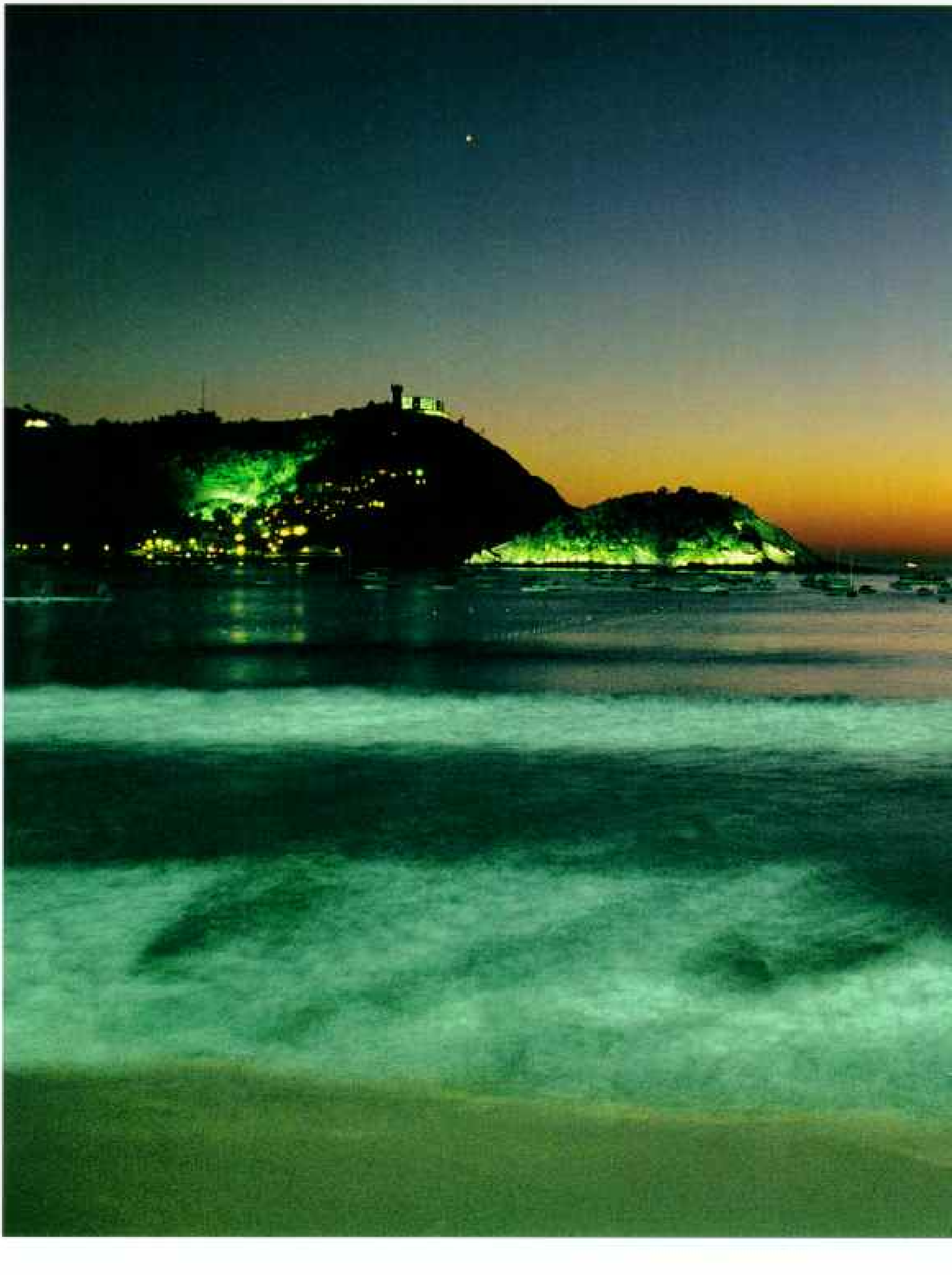


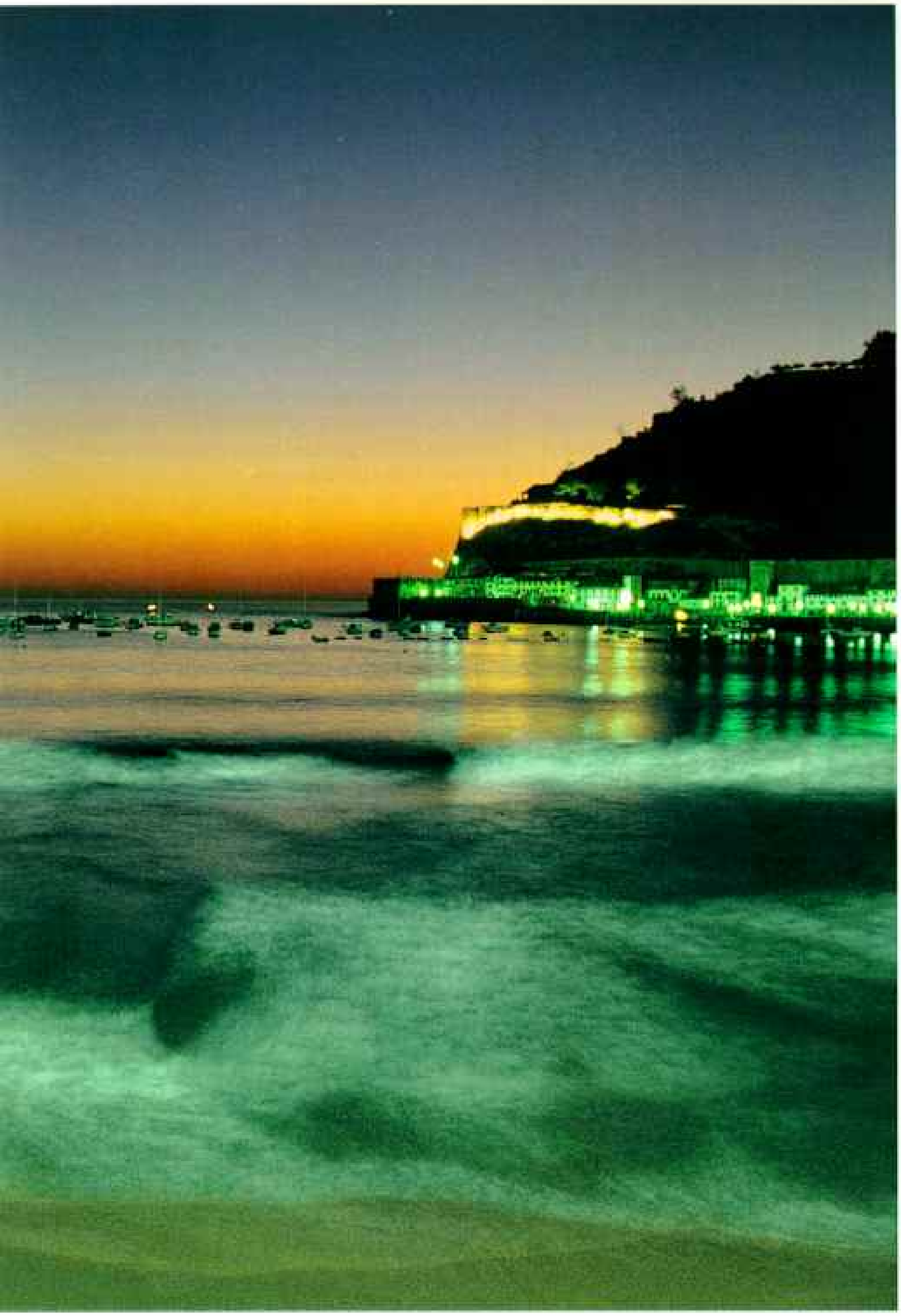
Europe's THE BASQUES

Martial pride in a 16th-century victory over French invaders brings out a festive army of Basques in the Spanish town of Irún. Memories run deep among a people who have defended their culture and corner of Europe since prehistoric times.



First Family





Jewel of Spain's Basque coast, San Sebastián's harbor looks out over the Bay of Biscay. Basques sailed with Columbus and helped colonize the New World, but their cultural center of gravity lies in their homeland in Spain and France. There traditions have endured in laws, music, dance, crafts, sports, cuisine, and, above all, language: Basque, which predates the Latin-based Romance languages, resembles no other tongue in Europe.

By THOMAS J. ABERCROMBIE
Photographs by JOANNA B. PINNEO

FROM ROAD'S END at Arantzazu Monastery it's only a two-hour walk through fragrant forests of beech and pine to the high, stony pastures of Urbia. Yet the well-worn track leading to this high mountain valley crosses a dozen millennia.

In fields shielded from the chill north winds by the mile-high walls of the jagged Aitzkorri Range, Basque shepherds still summer their flocks, surrendering to a seasonal rhythm unbroken since Neolithic times.

In early June men shoulder their packs and leave lowland farmsteads in the charge of their wives to push flocks steeply upward, dogs barking at their heels. For more than four months, until gray October skies threaten snow, they graze the hardy blackface *latxa* sheep through long summer days across rocky slopes. Evenings, they corral the ewes behind their stone huts for milking.

From a cloudy ridge above the valley I clambered down the final stretch just ahead of a gathering September rain. Nothing moved except the clouds and a sprinkle of white, grazing specks in the distance.

The weather caught me as I reached the small stand of trees that guarded the *txabola*, the shepherd's hut, of Ixidro Legorburu (pages 82-3). He and his son Gorka stepped out to quiet the dogs. Although I carried introductions from mutual friends, the tanned and weathered pair eyed me warily while we stood for awkward minutes in the drizzle.

Basques can be a cautious lot. "*Atzerri, otzerri,*" runs a local adage: "The alien's land is a land of wolves." But once met, they are indefatigable hosts. Soon we were sipping small glasses of red wine at Ixidro's hearth.

Surely what has bred this caution into the three million Basques—whose wedge-shaped homeland straddles the French-Spanish border along the western Pyrenees—is their long and turbulent history. Through the centuries, waves of Romans, Visigoths, Arabs, French, and Spanish overran them. But the Basques endured, often taking their traditions to the hills and forests for safekeeping. The same Pyrenees that separate Spain from the rest of Europe united the Basques.

In 1980 the three Spanish provinces of Vizcaya, Álava, and Guipúzcoa were officially joined as the Basque Autonomous Community. This is the Basque heartland, a 2,800-square-mile swath of green slopes and chestnut forests interrupted only by hillside villages and a handful of vibrant cities.

But the Basque country spills beyond these official borders. Basques call their nation Euskal Herria, or "land of the Basque language." And it is their ancient mother tongue that truly unites them. It was spoken here 5,000 years ago, before the Indo-Europeans arrived and spread out across the continent. And it is spoken today in cities and among the shepherds in the hills.

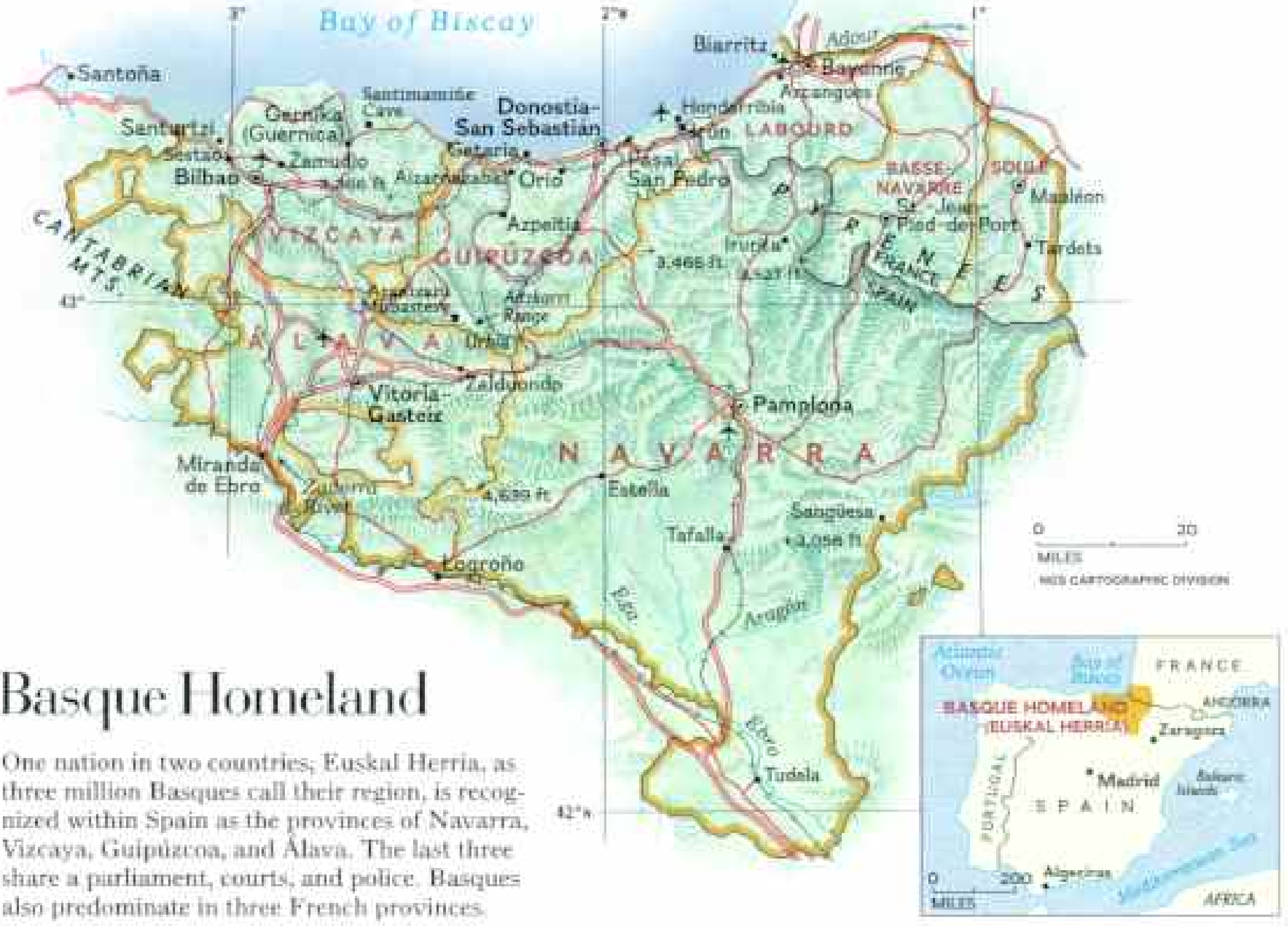
Ixidro and I converse in Spanish—slowly. It is, for both of us, a second language. "*¿Más vino?*" Ixidro fills our glasses even before his question is out, then pokes the fire with his hazelwood staff, setting the coals aglow. They light the weather-beaten face of a man in his mid-50s. His forehead and deep-set eyes are sheltered by a traditional wide black beret. With a worn pocketknife he slices cheese onto the plate between us.

"Pasture was good this year," he says. "We put up just over 400 cheeses." During the summer he and his son hand-press curds into three-pound wheels; in the rear of their hut, Gorka loads the last few into gunnysacks for the trip downhill.

A couple of chairs and a rough table furnish the spartan room. Strings of red peppers and spare sheep bells decorate one wall. On the opposite wall hang a painting of the Virgin Mary and a pinup calendar from a garage.

"I can get along in Arabic, French, Spanish, and German," says THOMAS J. ABERCROMBIE, who retired in 1994 after 38 years with NATIONAL GEOGRAPHIC. "If I ever thought I was a linguist, I had those illusions cured when I tried to learn Basque." JOANNA B. PINNEO photographed the Sonoran Desert for the September 1994 GEOGRAPHIC.

Banned during decades of repression under Generalissimo Francisco Franco, the Basque flag is paraded legally in memory of a member of the separatist group ETA. An ETA campaign of terrorism has diminished since limited autonomy was granted in 1980.



Basque Homeland

One nation in two countries; Euskal Herria, as three million Basques call their region, is recognized within Spain as the provinces of Navarra, Vizcaya, Guipúzcoa, and Álava. The last three share a parliament, courts, and police. Basques also predominate in three French provinces.

I mention several portents I have noticed: solar panels on isolated huts for a radio or TV; a radiotelephone at a mountaineer's retreat; a road working its way up from the village of Zalduondo. Herders are beginning to move livestock by truck, rather than by foot.

Ixidro nods. "We've been grazing this land since time began," he says. "But you are right; our world is changing.

"Twenty-five years ago there were 53 shepherds summering up here; today we are only ten," he says. "Our sons are turning down the shepherd's life for factory jobs.

"Gorka, here, has set his heart on the life of a truck driver," he adds with a sigh.

WHILE IXIDRO'S world changes, much of the Basque country seems to stay the same. From a hilltop in the heart of Guipúzcoa Province the panorama sweeps from the white limestone summits of the Indamendi Mountains, across misty green hills, and then drops 800 feet to the red-roofed harbor town of Getaria and the deep blue Bay of Biscay.

I had come to Guipúzcoa to spend a few weeks at a small country inn run by Josefina Peña and her family. Encouraged by a government program, hundreds of farmers have opened their doors to paying guests. It was hard to believe that this rustic hideaway lay only an hour or so by expressway from the major Basque city of Bilbao.

"I was born and raised here on this farm," Josefina said over breakfast. Her roosters had roused us early that morning. "After working several years for restaurants in town, my husband and I decided to start our own place."

The whole family pitches in. Josefina's teenage daughter, Alazne, was clearing away the dishes. Her son, José Agustín, was out collecting the eggs. Her brother came in from the morning milking with pitchers of fresh cream, followed by her mother with an apron full of

Inside players of business and finance deal a friendly hand of el mus, *a popular Basque card game, at the Sociedad Bilbaína. Founded in 1839, the all-male club numbers among its members the elite of Bilbao, the industrial, banking, and shipping center of northern Spain. A few blocks away in the city's Old Quarter a very different generation's tastes are given shape by innovative hairdresser Begoña Alegría.*

chestnuts. Josefina's husband, Agustín, was out getting groceries and wine. Only 81-year-old Pedro, her father, is exempt. On two canes he tottered past the window on his determined morning walk into the hills.

Josefina was clearly in charge. Only during the daily nine o'clock radio Mass, when she sat down by herself for coffee and toast, did she ever stop working.

"Basque society may be largely a man's world," she said, smiling, "but a Basque house is the woman's domain—here we reign supreme."

In neighbor Ernesto Txueka's vineyards I spent a morning filling plastic boxes with white grapes. A tractor would haul them up the hill to his presses. Ernesto's vines grow just above the sea, where waves crashing on the rocky coast salt the air. These slopes produce the fruity young wine so prized by the Basques themselves: *txakolina*.

"Txakolina is usually white. We blend in just 15 percent red *hondarribi beltza* to give it character," Ernesto explained. "It makes the perfect complement to seafood—salted anchovies or slices of fresh Getaria bonito."

He showed me the modern presses and stainless steel vats of his bodega, built beneath his house.

"Most txakolina is made in small, family cellars," Ernesto said. "People always considered it an informal wine, something for drinking at home, but in recent years the better vintages have become popular in restaurants."

I told Ernesto I had tried to find some of his wine—for gifts to friends back home—in several Getaria shops, but failed.

"Last year's production was sold out long ago," he said. But from his own cellar he brought up a few bottles and slipped them into my knapsack. "This year I've almost doubled production, to about 120,000 bottles. But it, too, is already spoken for."

Many of those 120,000 bottles were no doubt headed for the restaurants of Vitoria-Gasteiz, the Basques' cosmopolitan capital.

In downtown Vitoria, my friend Juan Trincado and I walked along the narrow, concentric lanes of the city's medieval core. The streets there still bear the names of the tradesmen they once housed: cutlers, shoemakers, painters, and blacksmiths.

Juan had arranged a rare invitation to dinner at one of the city's foremost gourmet societies, or *txokos*. "Altogether here in the Basque country there are more than 1,500 of these txokos," he told me.

On Calle Herrería, or Street of the Blacksmiths, we entered the Lagundi club. Its cozy dining room, opening on a vast kitchen, was already filled with members and their wives. Once all-male preserves, txokos now invite women to dine as well.

"Only the kitchen is off-limits to the ladies," said club president Julio Ulrich. He had just emerged from the wine cellar with an armload of an '86 Rioja bottled under the club's own Lagundi (meaning "friends") label.

"Good food and drink is the ideal centerpiece for an evening of fellowship," Ulrich said as we sat down to salted anchovies on lettuce and tender Urbia lamb chops in a pâté sauce.

"I want to be a shepherd too!" says five-year-old Andoni Legorburu, wearing father Ixidro's cap. His aspirations may change as jobs in towns and cities thin the ranks of young people tied to the land.

For now the seasonal rhythms of herding sheep remain. In spring Ixidro and oldest son Gorka walk 300 sheep from their valley farm to high pastures and a small stone cottage. Father and son milk the ewes and make cheese. When autumn skies darken, they move the herd down the slopes for winter.

After dinner, champagne and cigars stoked the fires of a Basque sea chantey:

By myself I dream,
Alone I come and go
Like the waves of the sea. . . .

BASQUES have looked to the sea for centuries. Their whaling camps stood on Labrador's stony shores long before the English arrived at Jamestown. Basque captains sailed the Atlantic with Columbus and carved the Pacific track of the famed Manila galleons.

In Getaria, in the small plaza in front of the town hall, the marble figure of Captain Juan Sebastián de Elcano cradles a compass in one hand and steadies a stone tiller with the other.

"Elcano was a junior officer with Magellan on the first circumnavigation," Getaria's mayor, Mariano Camio Uranga, told me in his office. "Magellan himself perished in battle in the Philippines. Ultimately four of the expedition's five ships were lost.

"Steering by way of the Strait of Malacca and around Africa, Captain Elcano brought 17 survivors back to Spain in 1522 on the only remaining vessel, the *Victoria*—the first ship to circle the earth."

From the town hall I followed the polished stones of Getaria's main street down to the harbor. The fleet was in, packed bow to stern, some 40 high-prowed tuna boats and a score of smaller coastal vessels, bobbing impatiently at their moorings.

Sailors crowded the waterfront, reworking nets and rope and grumbling over coffee at the noisy Itxas Etxe bar. A fishermen's strike

A shepherd's cottage is built of stone from the mountains that sheltered the Basques while historic tides of conquerors swirled around them. Blood-typing and other genetic studies show the Basques to be a people distinct from any other in Europe, rooted in the region of the Pyrenees and Cantabrian Mountains before Indo-European tribes arrived. As a saying goes, "Before God was God and boulders were boulders, the Basques were already Basques."

A jug of wine, a loaf of bread, and roast rabbit sustain farmhands in the Spanish Basque region, which is known for its simple country cuisine. Across the border, French kindred dip their manex sheep, a Basque breed. Virtually all Basques speak Spanish or French; a quarter also speak the mother tongue, in eight major dialects. "Different accents, but we can understand them, like British and Americans," says a Spanish Basque.

was dragging into its second week, and they had nothing to do but prepare for the next, unscheduled, sail.

Down the street from the bar, José Mari Irigoien, president of Getaria's 400-member fishermen's fraternity, was holding endless meetings with local wholesalers, Bilbao environmentalists, Basque trade commissioners, and federal economists from Madrid.

"Our market, Spain, eats more fish per capita than any other country in Europe," Irigoien told me. "But the French, with their three-mile-long nets and lower paid foreign crews, are undercutting us. Fishing techniques—especially net size and depth—are strictly controlled here. Of course, local distributors and canneries look to buy the cheaper foreign catch."

I boarded the *Izaskungo Ama*, a hundred-foot fishing boat painted the colors of the Basque flag—red, white, and green. Most of her 18 crewmen were busy polishing, painting, greasing winches, and stowing nets. Others rigged stout fishing poles.

"As soon as the strike breaks, we'll sail out 50 or 60 miles looking for bonito," said the captain, Jesús Mari Uranga. He was on deck scooping out handfuls of cod eggs to feed swarms of baitfish in their tanks. "We haul in 20-pounders—some get as big as 80 pounds—on hook and line.

"Later we will head to Madeira or the African coast to fish with our nets for three or four weeks," he said.

"We are worried. Not only do those big French nets threaten our fleet—250 trawlers altogether along the Basque coast—but the greedy long-liners, cleaning out everything, could spell death to the entire industry," he said. "Five years ago Basque boats landed 28,000 tons of bonito; last year the catch was half that.

"Some of us steamed out 600 miles last summer to join a Greenpeace protest against the

French long-liners. French Navy gunboats showed up. They fired on my boat with rubber bullets," he said, his eyes red with anger.

"If these foreign boats are going to destroy our way of life, to take away the livelihood of my family and crew, well, then I'm ready to go to war!"

I was near the French border when the strike ended. Boats from Hondarribia brought in the first catch in weeks. By dawn the men had loaded the fresh bonito, glistening gray fish more than three feet long, into tagged hampers. From there the fishwives took over.

Not barefoot women in shawls selling seafood along the docks from baskets on their heads: They survive only on postcards. Today's "fishwives" are women like Julia Martínez, whose blue apron and rubber boots could not conceal her business suit. On a cellular phone she talked prices with distant Zaragoza and Madrid. She was brokering her cousin's catch; her husband was still at sea.

"They offer only 264 pesetas [$2.00 U. S.] a kilogram," Julia sniffed, cupping her hand over the phone. "After the long strike the market is hungry for fish. I will hold out for 300."

She soon got her price. A dozen humming refrigerator trucks waited along the quay. By Spain's late lunchtime, Julia's fish would be gracing tables 300 miles inland.

Dynamo of Basque fortunes, Bilbao is Spain's busiest port. Iron ore from surrounding hills has long fed a metals industry, now in decline due to an aging infrastructure and increased foreign competition brought on by Spain's entry into the European Union. The Altos Hornos de Vizcaya steel mill (lower right), once the flagship of plants that line the Ría de Bilbao, is scheduled to close.

Membership in the EU has also brought tougher environmental controls. "I have seen the change," says bricklayer Emilio Enciar, digging worms to go fishing. "The river is cleaner."

TODAY MORE THAN HALF of Spain's 2.5 million Basques live in industrial towns and cities. And though Basques make up only about 5 percent of the population, they produce 10 percent of the country's exports.

In the factory city of Bilbao, Avenida Txabarri passes by the Altos Hornos de Vizcaya plant, the giant government steelworks. In a stream of sparks, white-hot metal flows from the seething furnaces to the casting sheds, filling the air with sulfur and soot.

Bilbao is Spain's chief port. Here a century of shipbuilding fed the country's industrial revolution. But aging plants, a worldwide shipping glut, and competition from a flood of European Union goods are taking a toll. Though average wages are higher than in Madrid, unemployment last year climbed to 27 percent and it continues to rise.

Still, while many industrial plants are closing, some succeed. I followed Bilbao's new expressway to Astilleros Zamacona, a busy private shipyard in Santurtzi. There, soaring black-and-yellow derricks clanged heavy steel plates onto giant platforms. Computer-controlled cutting torches traced wide arcs of fire, tailoring the curved hull sections of a new supertug.

"In the past we launched tankers and freighters—up to 300 feet long," said Pedro Garaygordobil García, Zamacona's young marketing director, as we walked around the noisy yard. "Demand these days is for smaller, high-tech support vessels."

Pedro showed me through a 160-foot-long freezer trawler and a pair of powerful tugboats, one for the Bilbao Harbor Authority, the other for the Red Sea port of Al Hudaydah in Yemen.

"These tugs are state-of-the-art, each fitted with twin 2,000-horsepower azimuthal stern drives—the rudders and propellers pivot as

units—for maximum maneuverability jockeying big ships in and out of crowded harbors.

"We're one of only two Bilbao shipyards still working at capacity," Pedro said.

Northeast of the city, in Zamudio, some 1,300 scientists and engineers ply their trades in the cluster of glass laboratories that make up the Basque Technological Park.

"Already 38 innovative young companies have set up business here," said the park's technical director, José Manuel Molinuevo Isasi. "They are pioneers in biotechnology, telecommunications, metallurgy, advanced software, robotics. Most are small, with 5 to 20 employees.

"With the decline of heavy industry, Basque manufacturers need to look to new futures," he said. "Here, we provide high-tech support facilities, floor space, and help with financing for promising new ventures—a kind of nest for fledgling companies."

In a laboratory at the ultramodern Robotiker plant, I watched remote-control lenses peer into red-hot castings where human eyes dare not look.

The automated assembly line at Indelec, a Basque-Swedish joint venture, was a row of glass-walled compartments. Inside, robot soldering irons hissed around tiny circuit boards of radiotelephones destined for Spain's cross-country microwave system. Inspectors in white lab coats checked the frequency ranges and completed the final assembly.

ALTHOUGH SCIENCE and technology are changing the look of the land and the nature of work, a long history of struggle for regional autonomy remains the cornerstone of Basque identity.

In San Sebastián (Donostia to the Basques), I climbed the marble stairs of the provincial government building, the Palacio de la Diputación, and squeezed in behind delegates seated at their walnut desks for the annual state-of-the-union address. Below a large canvas of Spain's king, Juan Carlos, two soldiers, dressed in the brocaded regalia of 14th-century Basque guardsmen, flanked the speaker, Parliamentary President Jon Esnal Alegría.

"We have won back our destiny," he said. "Now it is time to end the violence that has so long stained our lives."

After the speech Esnal walked me around the historic neoclassic building and recounted highlights from the Basques' tumultuous past.

"Since the Dark Ages we Basques have governed ourselves with village councils and ancient charters called *fueros*," he said. "These fueros guaranteed local autonomy, provided us a constitution, and regulated daily life, often in great detail—the obligation to provide fire for a neighbor's kitchen, for instance, even specifying the rites for mourning the dead."

As each of the Basque provinces came to recognize the suzerainty of Castile—beginning with Guipúzcoa in the 13th century—they insisted that the Spanish rulers accept the Basque fueros that guaranteed freedom from Spanish taxes, exemption from military service, and rights to free trade.

"Only in 1876 after a series of upheavals in Spain—the so-called Carlist Wars—were the thousand-year-old fueros abolished by the Spanish overlords," Esnal told me.

Basque fortunes hit bottom under Generalissimo Francisco Franco. To break Basque spirit during the Spanish Civil War, the dictator enlisted Hitler's new Luftwaffe to experiment on the historic town of Gernika (known to many by its Spanish name, Guernica, from Picasso's famous painting). On a busy Monday in 1937, squadrons of Heinkel-111 bombers and Messerschmitt-109s demolished the town center, then dived in again to machine-gun the fleeing population. Some 1,500 Gernikans died.

After crushing the Basques' resistance, Franco began purging them of their heritage, closing Basque schools and newspapers, prohibiting public use of the Basque language, jailing intellectuals.

Altogether, the war sent an estimated 50,000 Basques to their death and 100,000 to prison. Another 200,000 went into exile. New Basque resistance movements formed underground and began to multiply.

The extremist ETA (Euskadi ta Askatasuna—Basque Homeland and Freedom) launched bolder and bolder terrorist attacks against government officials and police. In December 1973 the group assassinated Franco's chosen successor, Prime Minister Luis Carrero Blanco, in Madrid. A bomb blew his car 60 feet into the air.

Not until 1980, five years after Franco's death, would anger begin to cool and Spain allow the formation of the Basque Autonomous Community. Nearly every Basque now agrees on one thing: The future should be

Summer's height brings a crowd to the French town of Biarritz, hailed as "queen of resorts and resort of kings," a watering hole for the powerful and famous since Napoleon III built a palace here in 1854. The royal residence is now the exclusive Hôtel du Palais. A vista from the hotel's terrace sweeps across beaches enjoyed by Europeans of all incomes.

decided by negotiations, not violence. In 1994 one of ETA's founders, Julen Madariaga, publicly called for an end to terrorism.

"Always lamentable, these acts have now become politically counterproductive," he said in a Basque television interview.

Yet to be resolved is the fate of 560 Basque political prisoners still held in Spain. Some 2,000 more accused terrorists live in exile, mostly in France. I met some of the prisoners' anxious relatives through Senideak, a family-support group that has its headquarters in Bilbao.

"They arrested our son, Markel, ten years ago. He has never even been charged, but he is still in prison, in Algeciras, 500 miles away," said Nikola Madariaga, a Bilbao architect—and a brother of the ETA organizer.

Holding back tears, Nikola's wife, Teresa, showed me a letter from their son. "Be brave until I return," it read. "This is a small price I pay for freedom in our land."

"The war is over," Nikola said. "The soldiers should be freed."

Today the long-prohibited Basque flag flies from every balcony. The red and yellow colors of Spain have all but disappeared. In San Sebastián I passed only one small flag, at the local office of the Guardia Civil, Spain's national police force. It was guarded by a young rifleman in full combat gear. From under his steel helmet, he eyed the street nervously, as if covering a retreat.

THE BASQUES' SPIRIT of nationality is reflected in their many competitive sports. Jai alai, played today across the world, is a Basque invention. Each town has its *frontón*, or ball court, many sharing a wall with the village church. In the 1600s the Basques took the game of handball, which itself dates from well before ancient Rome, and added bullet-like velocity and hook-shaped baskets, the first of which were

Thundering hoofs and scampering feet race through the streets of Pamplona in the daily "running of the bulls" during the weeklong Festival of San Fermín. Early each morning half a dozen bulls gallop to the stadium, where they will fight and die that day. Daredevils run before them, carrying rolled newspapers to swat the bulls in a perilous sport that last July cost one young American his life.

In a rare moment of quiet, a cabezudo, or big head, takes a break from the frenzy of San Fermín. Papier-mâché masked figures loom over crowded streets, tapping rowdy celebrators with their staffs. The festival commemorates a third-century bishop born in Pamplona and now considered to be the patron saint of bullfighters.

The fiesta's raucous tone carries into the arena, where revelers soaked in wine show tipsy approval of a matador's performance. In 1926 Ernest Hemingway captured San Fermín's wild spirit in his novel The Sun Also Rises.

wicker panniers used for gathering apples.

At the new indoor court in Mauléon in the Basque region of France, I watched champions Etxaluz and Felix take on Kompa and Marmouyet. Their shoes blasted out piercing squeaks as they snared returns and spun the ball out of the wicker, sending it whistling back to the wall at 150 miles an hour.

Every Basque fishing village also has its own rowing team—13 powerful oarsmen and one on the rudder of the *trainera*—competing up and down the coast. The matches go back to the 12th century, when whalers, alerted by spotters on village watchtowers, raced out to hunt the giants that once breached along the coast. The fastest team got in the first harpoons.

In San Sebastián, at the annual rowing championship, tens of thousands lined the sands of La Concha beach and filled the ledges of Igueldo and Urgull, the mountains that frame the entrance to the city. Aboard the press boat I joined the colorful flotilla lining the buoyed racecourse.

At noon sharp they were off. The favorite, a purple-colored longboat from Pasai San Pedro, gained an early lead over the yellow hull from Orio. Flashing oars carried it past the islet of Santa Clara at 12 knots or better. But rounding the outer marker too closely in choppy three-foot seas, San Pedro's crew scraped the steel buoy and holed the boat. It began taking on water. Down the return leg the crew sweated harder as the Orio boat narrowed the gap.

The spectator fleet fell in behind the racers—tourist launches, trawlers, and cabin cruisers swerved among kayaks, barges, rubber rafts, sailing yachts, even an old wooden shallop carrying a loud oompah band. Its music was drowned out by cheers, the clanging of fog bells, and blasts from ships' horns.

It looked to be a photo finish. But, even with 60 gallons of water in the bilges, San Pedro won the day.

Throughout the year scores of festivals highlight sports with rural roots: sheepdog trials and ram fights; *harrijasotzaileak*, or stone-lifting competitions; and *aizkolariak*, log-chopping contests.

At the fiesta of San Miguel in Aizarnazabal, a fife and drum led the fanfare as stone-lifting champion Goenatxo II strode onto the court, followed by four assistants lugging a 420-pound granite cube in a long-handled box. They helped wind the champion into his 30-foot-long cummerbund.

He was a giant of a man, wearing a padded vest, dark trousers with padded knees, and old-fashioned tennis shoes. While his assistants rubbed the stone with rosin, he taped his fingers and pulled on a pair of cutoff gloves. Now he was ready to challenge the record: nine lifts of 420 pounds in five minutes.

The whistle blows. Goenatxo grips the granite block and rolls it smoothly onto his thigh, then his chest, and finally his shoulders.

In unison the spectators begin the count: "*Bat!* One!" The stone slams down to the ground. After a few deep breaths he begins muscling the block to his shoulders again and again. The crowd counts off each lift: "*Bi! Hiru! Lau! Bost!* . . ."

"*Sei! Zazpi! Zortzi! Bederatzi!*" He matches

A candlelit crowd gathers in the plaza in front of City Hall on the last night of San Fermín and sings a mournful song: "Poor me, poor me! How sad am I. Now San Fermín has ended. Woe is me." Festivalgoers will disperse to all corners of the world, but the Basques of Euskal Herria will remain to shape the future of Europe's oldest ethnic group.

the record, and nearly a minute remains.

The crowd is on its feet. Goenatxo's biceps glisten with sweat. The crowd screams the count, *"Hamar!"* Veins bulge out on his neck and forehead. His cheeks puff out, and his eyes go white. *"Hamaika!"*

For the 11th time Goenatxo shoulders the stone—and a new record.

FIFTY MILES NORTHEAST on the coast of France, the elegant mansions and plush hotels of Biarritz buzz with the comings and goings of tourists from around the world.

Tourism officially began here in 1854 when the Spanish bride of Napoleon III, Empress Eugénie, persuaded him to build their summer palace overlooking the sea. Their guests included the cream of Paris society, Russian princes, and the crowned heads of Britain and Spain.

Through the years the resort town, with its 11 golf courses, casino, saltwater spa, and convention centers, has attracted the highborn and the famous—Clemenceau, the Duke and Duchess of Windsor, Churchill, Stravinsky, Hemingway, Chaplin, Bing Crosby, the J. Paul Gettys, and the Henry Fords.

As official greeters for Biarritz, the lords of Arcangues, a village five miles inland, have been hosting VIPs ever since the late 1700s, when Louis XVI granted them the French title of marquis. The present marquis, Guy d'Arcangues, can trace his line, unbroken, to 1150. At his château he showed me the mahogany-and-brass bed where Napoleon Bonaparte passed a night in 1807.

"Later the Duke of Wellington slept here when he made the château his headquarters for several weeks in 1814," the marquis said, as we headed off to dinner, a candlelit sit-down affair for 60 black-tie guests, backgammon enthusiasts in town for a tournament.

After the *foie gras, champignons sauvages, dos d'agneau farci,* and *chocolat à l'impératrice,* we drank coffee in the White Salon amid 18th-century Gobelin tapestries. In the Red Room the marquis showed me a prized artifact, a gold-fringed Basque flag.

"Our Basque origins are sometimes overshadowed by our long allegiance to France," he said. "But during the Spanish Civil War we smuggled in Basque refugees from Spain. This regimental flag was given to my father by Basque soldiers forced across the border by Franco's armies."

The marquis himself knows firsthand the fortunes of war.

"During World War II, Nazi officers took over the château. I was packed off to a labor camp in Silesia," he said. "There, to earn cigarette money, I took up the barber's trade."

On the wall of his study, among letters and autographed pictures of General de Gaulle, Somerset Maugham, and Prince Rainier, hangs a photograph of the marquis giving a trim to one of his guests, Frank Sinatra.

IN THE BASQUE COUNTRY old and new continue to overlap. On my last weekend in Spain I trekked along the valley of Oma, outside Gernika. Here modern artist Agustín Ibarrola has painted the trunks of hundreds of pines to create a startling outdoor gallery. Close by, in the Santimamiñe Cave, a prehistoric artist left a gallery all his own.

From the cave's entrance caretaker David Bengoetxea led me down some 200 feet into a small, dim chamber, where our flashlights illuminated a finely sketched trio of bison, a prancing horse, a goat, and a bear.

"Archaeologists date the paintings to the end of the last glacial period, 15,000 years ago," Bengoetxea said. "But experts differ on their meaning. Purely aesthetic? A celebration of a hunt? More likely, given the remoteness of this deep sanctuary, they were powerful religious symbols."

Today's Basques bow to other icons. They have been Christians since the fifth century and now also pay homage to the gods of change. Often I whizzed by the new temples of glass and steel on my trips along the Bilbao-San Sebastián expressway.

With their destiny once more in their own hands, the hardworking Basques have taken their place among competitive modern nations. □

In Praise of Squirrels

By DIANE ACKERMAN

Photographs by CHRIS JOHNS

Making the rounds in Manhattan's Union Square Park, a gray squirrel plucks a nut from a kindly hand. Whether begging in city parks or foraging in country woodlands, the eastern U. S. native has found a place in countless hearts—and bird feeders.

ONE MISTY, rain-soaked April morning, I crank open a garden room window and call the squirrels as usual, warbling to them in a melodic two-note that starts high and slides lower: "Squirr-rels, squirr-rels, squirr-rels." Then I quickly scatter a mix of peanuts, hazelnuts, Brazil nuts, and almonds in a wide arc. The nuts are unroasted, unsalted, and still in their shells, just as squirrels would find nuts in nature.

Knowing this unseasonal bounty will soon be devoured, I sit back and survey the dawn. There's nothing like the fecund beauty of spring in upstate New York. Separate raindrops lie along the twigs of a maple branch—round, brilliant globules—trembling without falling. All the light of the morning seems trapped in their small worlds. You can smell the mixing fragrances of spring, budluscious and full of growth. But it's a hard time for animals. Roused from their winter stupors, they find food scarce and little yet in bloom.

Dark scufflings begin deep in the two acres of woods as squirrels leave the warmth of their leaf nests and rush down tree trunks, leap across brush and woodpiles, and run along telephone and electric wires toward the house, using their tails to balance tightrope-walker style. A drumroll across the roof grows louder and then stops. I feel something watching me, look up, and see the Pleader—a large muscular male gray squirrel—on the roof, examining me, the morning, and the sudden appearance of manna. Whiskers twitching, he leans over the edge and fixes me with dark shiny eyes.

"Breakfast?" I ask.

He coils up, raises and lowers his head rapidly, springs off his haunches, leaps eight feet to a slender hickory, is down its trunk in four strides and at the window in two more. It's not that the strewn nuts aren't appealing; it's just that the Pleader prefers walnuts, and, as he knows by now, I keep those indoors.

Holding a walnut lightly between my thumb and forefinger, I offer it to him and feel the gentlest tug as he lifts it free. Then he swivels around fast, takes a watchful position on a rock, and turns the nut with his paws until he finds the exact spot to drill a hole. This he does with his chisel-shaped front teeth. He carries it like a bowling ball as he runs to a large hickory and scampers up its shaggy trunk to the first branch. From that lookout post he can see a mob of squirrels arriving, grabbing nuts, squabbling over status. He widens the hole in the walnut and attacks the meat, spitting out a plume of husk fragments.

"What a buzz saw," I say, smiling. He continues to watch me with a look of uneasy vigilance. When he finishes half of the nut, he holds the remainder like a bowlful of porridge and carefully lifts out the nutmeat.

Eastern gray squirrels are small mammals belonging to the order Rodentia, a word that derives from the Latin *rodere*, which means "to gnaw," one of their best known (if not best loved) skills. Their ancestors appeared in the fossil record about 35 million years ago, and they have hundreds of cousins around the world (flying squirrels, fox squirrels, red squirrels, Persian squirrels, pine squirrels, tassel-eared squirrels).

Grays usually reach a length of about 18 inches, half of which

Sharp eyes scan for predators before a squirrel settles down in a tree trunk to nurse her young. Always on the alert, mother squirrels survey several nest sites in tree hollows or on branches. If trouble comes—or fleas take over—they simply pack up their brood and move.

Poet, essayist, and naturalist DIANE ACKERMAN is the author of 12 books, including, most recently, *The Rarest of the Rare: Vanishing Animals, Timeless Worlds*. CHRIS JOHNS's photographs illustrated the article about Hawaii's endangered species in the September issue.

Leg muscles alone can propel a gray squirrel eight feet; by using its tail as an airfoil it can soar much farther. "Squirrels can fall a hundred feet and scamper off unharmed," says Maryland wildlife biologist Vagn Flyger, "which makes me think the tail may also serve as a parachute."

consists of bushy tail. A full-grown adult weighs between 12 and 26 ounces, and males and females look the same both in size and color. Social rank often depends on weight and age. They live in tangled pockets of leaves, twigs, moss, sticks, and whatever else opportunity provides—Kleenex, Christmas decorations, molted hair. The nest is roughly two feet in diameter, built in a tree hollow, perched on a branch, or wedged in the fork of a tree.

Females bear a litter between February and April, and sometimes another in midsummer. After a pregnancy of 40 to 44 days, mothers nurse three to five newborns for as long as ten weeks. Squirrels may live 15 or 20 years in captivity, but their life span in the wild is often only one year. They fall prey to disease, malnutrition, marauding red-tailed hawks, crows, weasels, owls, foxes, raccoons, dogs, cats, cars, and humans. Many homeowners regard squirrels as pests. Last year, hunters in New York State reported killing 577,211 squirrels during a six-month hunting season.

All the same, squirrel-watching has become a national pastime and squirrel feeding a parkgoer's treat. Although I enjoy studying animals in the wild, I also relish the natural mysteries and dramas that surround us every day. I can only begin to list the many animals that inhabit the small patch of woods behind my house, from deer, raccoons, skunks, wild turkeys, and garter snakes down to spiders, moths, and swarming insects. I spend happy hours there watching nature bustle about its business. The animals all seem to be running intriguing errands, especially the squirrels, a changing assortment of which I observe throughout the year.

I ESPECIALLY ENJOY the Pleader because of the way he finds me in my study or in the living room and gives me a look insistent as a placard. When he gets my attention, he runs to the glassed-in garden room, races up to the window, and stares. He stands up on his back feet, arms held to his chest, stretching to look in, face alert and expectant. Above all, the Pleader is daring—brave enough not to flee when I open the creaky window. Brave enough to take a large walnut from my hand. Brave enough to drive off competitors from his small pile of food. Often when I open the window, he comes up and puts his head inside, watching me as I reach into a half barrel of nuts. If I leave the window and nut barrel open, he will climb right in, help himself, and dart outside to eat. When the window is closed, he puts his eye up to it and peers in. A small irregularity on his left ear is his only marking, but I always know him by his unusual alertness, muscular shoulders, and eager, exploratory verve.

Mind you, this is nothing compared with the legendary chutzpah of squirrels. *Daylight Robbery!*, a British film about gray squirrels, reveals the high jinks of one that figured out how to break into a vending machine. The squirrel enters through the opening at the bottom, climbs up inside, and moments later

returns with a Baby Ruth bar, which it calmly unwraps and eats. I've known of people setting obstacle courses for squirrels—the most ingenious one requiring them to climb a pole inside a clear plastic chimney, leap to a windmill, cross a chain studded with spinning disks, run through a canvas tunnel, grapple with a length of slippery rollers, fly across the yard in a red rocket ship, and, finally, leap eight feet to reach a pile of hazelnuts. It took the squirrels just over a month to master.

Myself, I put up a squirrel gymnasium, which includes a Ferris wheel of four corncobs, a tiny picnic table with a chair the squirrel must sit in if it wants to eat from a corncob, a Pandora's box filled with peanuts (the lid is too heavy for birds but perfect for a squirrel to lift to remove nuts one at a time), a seesaw with a corncob at either end, and a trapeze with a corncob in the middle. They figured out all five within half an hour and seem to enjoy the challenge each offers. It gives me a better chance to observe their stretchings, agility, and undersides.

It's hard to choose what I like best about squirrels. No other animal looks so much like eagerness incarnate as a squirrel standing up on its hind legs, sniffing, erecting its ears, hands at its chest, eyes wide and wet. "Did that human just drop something edible?" its whole body seems to say, as it watches me toss apple slivers and sunflower seeds onto the snow. Squirrels will stare right at you, seeming to hold your gaze with their large almond-shaped eyes.

A relaxed squirrel looks like a relaxed spaniel: sprawled out with all four legs splayed, tail on the ground, head lolling between its paws. But there seems little relaxation in the world of the squirrel. Rainstorms soak the fur, crows and raccoons steal the young, food must be found for both now and later. If chased, a squirrel often runs straight at a tree, then does a Fred Astaire move—leaps against the trunk and springs away. When squirrels get frightened, their palms sweat the way human palms do. After a long, aggressive standoff, as a squirrel moves aside, I've seen small paw prints on the flagstones.

MY SQUIRRELS keep the same hours as hot-air balloonists—they are most active at dawn and sunset. Early in the summer all the squirrels seem to be swept up in mating chases, spinning around tree trunks, waltzing around the yard. In a hormonal frenzy, they'll chase around, across, and over most anything. Two biologist friends were astounded one day to find two squirrels leaping onto *them*, spiraling around their bodies, and leaping away in their distraction.

When the females go into estrus, they exude a fragrant hormone that scents the air. From a squirrel's perspective, the woodlands are drenched in the smell of sex. A male sniffs around the nether parts of a female. She coyly moves a step or two away. He follows and sniffs, she steps away. He sniffs even the grass where she sat. He sniffs her shadow. She bolts. He follows. She slows down. He gains on her. She waits. He grabs her around the middle, as if doing the Heimlich maneuver; she moves her tail to the side, and they mate. But only when she allows him to.

A female chooses her mate from a posse of ardent, fleet-footed suitors—it takes speed, agility, and persistence to win sexual favors. Some females choose males that have already ingratiated themselves and accompanied them while feeding. Or, to put it in human terms, I think they prefer friends. Of course, a gigolo male may cozy up to several females, so that when the mating chases begin, he'll be close at hand and familiar and thus unlikely to be rebuffed. After mating, the male leaves the female to fend for herself, while he chases others elsewhere. Only fertile for one day, the female turns her attention to nesting and collecting food.

Squirrels are excellent greengrocers, first-rate assayers. I often see them judging nuts by weighing one in each paw, testing for the most value but also for freshness. In addition to nuts, squirrels also enjoy fungi, buds, flower shoots, seeds, berries, apples, catkins, caterpillars, and other delicacies. In winter I've seen a squirrel peel the bark off a tree to lap the sweet sap underneath.

Young squirrels learn to recognize different kinds of nuts, full ones from empty ones, fresh ones from weevil-infested ones, by both odor and weight. This shouldn't surprise us. Blind for five weeks, nestlings depend on smell, hearing, and touch.

When they finally emerge from their leaf womb, they develop keen visual skills, but they can still smell their way along tree branches to find mother and food. All the mixing fragrances of the nest include the mother's unique fingerprint of odors and the educational smell of her meals. Returning to the nest with food, the mother partly chews it, and the youngster puts its face up to hers and sniffs what she's eating or actually takes food from her mouth. "Mom likes it, maybe I'll like it," the instinctive motto goes. We do much the same, of course, giving our children cut-up morsels as we dine.

Few things in nature are as marvelous as a squirrel's tail. Or as transformable. The tail is an all-purpose appendage: a balance

A falconer's hawk carries off its prey, killed by dagger-sharp talons. Acute vision and reflexes help gray squirrels elude predators, but escape from human hunters is not so easy. Each year 25 to 40 million are shot for sport and food in the U. S.

pole, a scarf on cold days, a semaphore flag. Indeed, the name "squirrel" comes from the Greek for "shadow tail." When marking its neighborhood, a squirrel flicks its tail in an arpeggio of twitches, then moves a few feet up the tree trunk or along the branch and marks again. Sometimes, in strong winds, a squirrel's tail blows forward over its forehead, and it looks like a balding man who has combed his hair all to one side only to find it blown straight up in a breeze. It's amazing how a squirrel can clasp itself on the back with its tail, embrace and comfort itself. When it rains, squirrels fold their tails up over their heads as umbrellas. Tails are cozy as sweaters—squirrels can wrap up in them when cold or lay them aside when warm or wrap them around small offspring.

Squirrels prefer to carry their food up a tree to a low secure branch, arrange themselves with their tails curved in a question mark, and scout the ground below as they dine. When they eat, they hold a nut with both paws together like mittens. Squirrels have four long fingers on each hand, but they don't flex or bend them for eating. Fastidious about fruit skins, they carefully peel grapes and apples with their teeth while eating them. When they chew, their cheeks move a lot and their long whiskers twitch. Whiskers are sensing organs, so squirrels must feel the movement of air, snow, wind, and rain as they eat, which probably adds to the pleasure. On the ground, squirrels face upwind when they eat, so that their fur will be ironed shut by the wind.

Sometimes squirrels hang from their hind feet, stretching long down a tree trunk, their tummies pressed against the bark as they devour a nut held in their front paws. They look perfectly comfortable upside down, as bats do. Tendons in the feet, when stretched, automatically pull the toes closed. That's also how birds sleep securely on branches without falling off.

ONE BLUSTERY MORNING a dozen grays are breakfasting outside my garden room window. Four more grays, bounding in from a neighbor's yard, pause to make a sudden detour. Masters of circuitousness, sly indirection, the long way round, squirrels don't like to head straight for anything. For safety they may run past and sweep around from the side. And that's just what one husky gray does, running a circle around the others to see if there's room enough to squeeze in behind.

There isn't, so the only alternative is to challenge one of the others by running at it until it leaps straight up, jumping right over the challenger, launched by the trampoline of its fear and aggression. Husky takes a position at the nut feast I've strewn, and the others soon find new positions. They're a little too close together, so they all eat with their tails folded into pompadours high over their heads to make themselves look taller, like big, bad, hoodlum squirrels, and I guess it works.

Soon another intruder arrives, a medium-size gray with a brown chin strap, and it takes a spot close beside a plump female named Collops. With her personal space threatened, she faces her foe and sits still, but rapidly twitches her cheeks and, with them, her whiskers. It's a visual growl. Even though her mouth is busily chewing almonds, she makes small insistent harmonica-like noises. "Too close! Too close! Too close!" they warn. Chinstrap doesn't retreat, and Collops cheek-twitches while bending her tail right up and over her back and head into a warbonnet, while growling a syncopated terror whine that sounds like a swarm of insects. Still Chinstrap won't budge, so there's nothing left but to tussle, and tussle they do—first leaping high to kickbox, then shrieking while nipping at ears and flanks. The other squirrels watch and make elbowroom but continue eating.

In a moment it's all over—the lunging, the chasing, the scolding—and Chinstrap swiftly gives ground. Though there are no serious injuries, it seems to be a technical knockout. Collops picks up a peanut, rips the husk off, and settles down to eat, while keeping a steady eye on Chinstrap, who circles round the crowd and finds a less-than-ideal spot at the edge of the banquet.

A crow calls loudly, other birds join in, and the squirrels dash for the trees. Birds sometimes attack squirrels in the trees, but they don't like to battle sharp teeth and powerful jaws. Raccoons may raid the nests to steal babies, but they don't like to duel with the adults either.

The ground is a land of greater vulnerability, so at the first sign of danger squirrels climb. In the rain forest in Brazil I've seen golden lion tamarins move crabwise around a tree trunk when a hawk flies overhead. Squirrels do the same to keep out of sight when a bird snoops or threatens. The world of the squirrel is more vertical than horizontal, an Escher-like kingdom of pathways and labyrinths, signposted both visually and by smell.

Squirrels share their tree homes with untold numbers of insects, spiders, ticks, and mites. Gray squirrels give sanctuary to the squirrel flea, *Orchopeas howardi*, whose larvae sometimes swarm in the nest linings. Certain beetles visit the nest to feed on the fleas. The beetles appeal to other insects, and so it goes, until the nest becomes its own twitching ecosystem.

No one knows why, but a mother will at times laboriously

On the mend after a hawk attack, a squirrel clambers over its benefactor. Once fully recovered, it will be released into nearby trees.

Clutching a stethoscope, an orphaned male is checked for pneumonia by one of some 40 state-licensed volunteer rehabilitators in Northern Virginia.

Tucked in new nests, squirrels of different ages fill Barbara Prescott's nursery. "I often have wall-to-wall cages in here," says the Virginia rehabilitator.

Female squirrels give birth to two to five young per litter. Caregivers feed a special formula to week-old orphans, near right. Eyes are still shut at three weeks, above, and at four weeks, far right. By five weeks, above right, they nibble fruit and nuts with eyes open.

The irresistible scent of sunflower seeds lures gray squirrels to perform high-wire acts to get at them.

Apparently not handicapped by its missing tail, Stumpy takes on a feeding rig in biologist Vagn Flyger's backyard (right). Hanging by its feet, Stumpy begins a series of quick tugs. After three weeks of trial and error, the squirrel learns to hoist the can of seeds—dexterity and perseverance are rewarded.

Squirrels thrive in urban settings largely thanks to their intelligence and adaptability. People help out too. A Washington, D. C., woman is said to have once spent $1,000 a year to feed the squirrels in Lafayette Park.

Many bird lovers search long for that ultimate garden accessory—a squirrel-proof bird feeder. Rising to the challenge, manufacturers sell a number of gadgets designed to foil the artful dodgers. Some work.

Making a getaway, an unauthorized visitor to the White House lawn dashes off with a peanut. Groundskeepers erected squirrel feeders to entice the rodents away from flower bulbs, a solution that sometimes works for gardeners, who concede: If you can't beat 'em, feed 'em.

carry her young to a new nest. Perhaps she is escaping the infestation of bugs. Perhaps she is trying to baffle predators. She carries the babies one by one in her mouth, her jaws gently around their bellies; they wrap their legs around her neck and become a squirming pink collar. Alert to her nestful of squealing young, she doesn't stray far to feed. So I see the same females daily at the feeder. Males, on the other hand, roam over a wider range (up to seven acres), tend to be loners, and may not show up for a week or more.

AS DEEP SUMMER ARRIVES with its baggage of hot humid days, I discover a serious change in the squirrels. They come for nuts and sunflower seeds, as before, but they're much more aggressive, challenging one another, growling, and leaping ninja-like, flailing with claws and teeth. When I feed them now, I'm careful to scatter the seeds over six or eight feet, because they can't seem to resist warfare if another squirrel is within pouncing distance. Most have bite marks on their ears and claw scars on their coats. One squirrel's left ear is split in three—Fork Ear, I call him—and he is the fiercest, driving off the others with much savagery. Another has only half a tail and drags the stump behind him like a pirate with a wooden leg.

And where is the Pleader? I haven't seen him for days, and I fear he may be dead, a victim of battle. Or perhaps he fell from a tree. (This happens from time to time, especially if a squirrel is old or weak.) Are new Young Turks—plump, strong, with few visible scars—demoting and dashing the elders? Has there been a coup, with the Pleader and his kin driven off?

Once I watched, amazed, as an odd war drama unfolded in my backyard. Two armies of squirrels faced each other on the pool deck and then, at a signal I couldn't detect, suddenly charged in a pitched battle. One squirrel fell in the water and struggled to climb out, then shook itself and ran away; others were scratched, bitten, and chased up and out of trees. I've never before or since seen them fight formally like that.

At sundown one August day seven squirrels feed tolerantly outside the windows. Fork Ear clearly rules the territory. A shudder of leaves and bushes catches my eye, and I see a battered, frightened squirrel staring tentatively at the seeds. A large patch of fur is missing from his back and head, where raw skin shows. When I see his earmark my heart sinks and soars at the same time. It is the Pleader! But he's woefully subdued, all the spirit knocked out of him. I open the window, but he doesn't come. Later he returns, when all the others have gone, to feed by himself. It is painful to see him so broken and ill. Even if he builds up his strength on the nuts and seeds, will he dare the yard when others rule?

The next day the Pleader drags in again after most of the other squirrels have fed. I toss nuts out to him, and he eats a few, patiently, slowly, in a kind of trance. The others growl at him, one attacks, and he leaps onto a sapling. Then he returns, eats one nut, and leaves. The wound on his back reveals angry flesh, and his eyes are lusterless, not glossy and alert. The change in personality is startling. For a while there weren't enough nuts in the world to eat or store. He wanted all of them and could drive away any squirrel that bothered him. Now he seems lethargic and frail, with little appetite. Slowly he climbs up the large hickory and lies down on a branch, while the others feed below. A human in that condition we would call depressed.

After a few weeks he begins to

heal—a recovery that seems miraculous—and he again chases and harangues the other squirrels. Once more he comes to the window and puts his head in for a walnut, which he takes with a delicate, tentative tug of his teeth or, occasionally, grasps with his paws. He may have been ousted from this territory, but he's fighting his way back in.

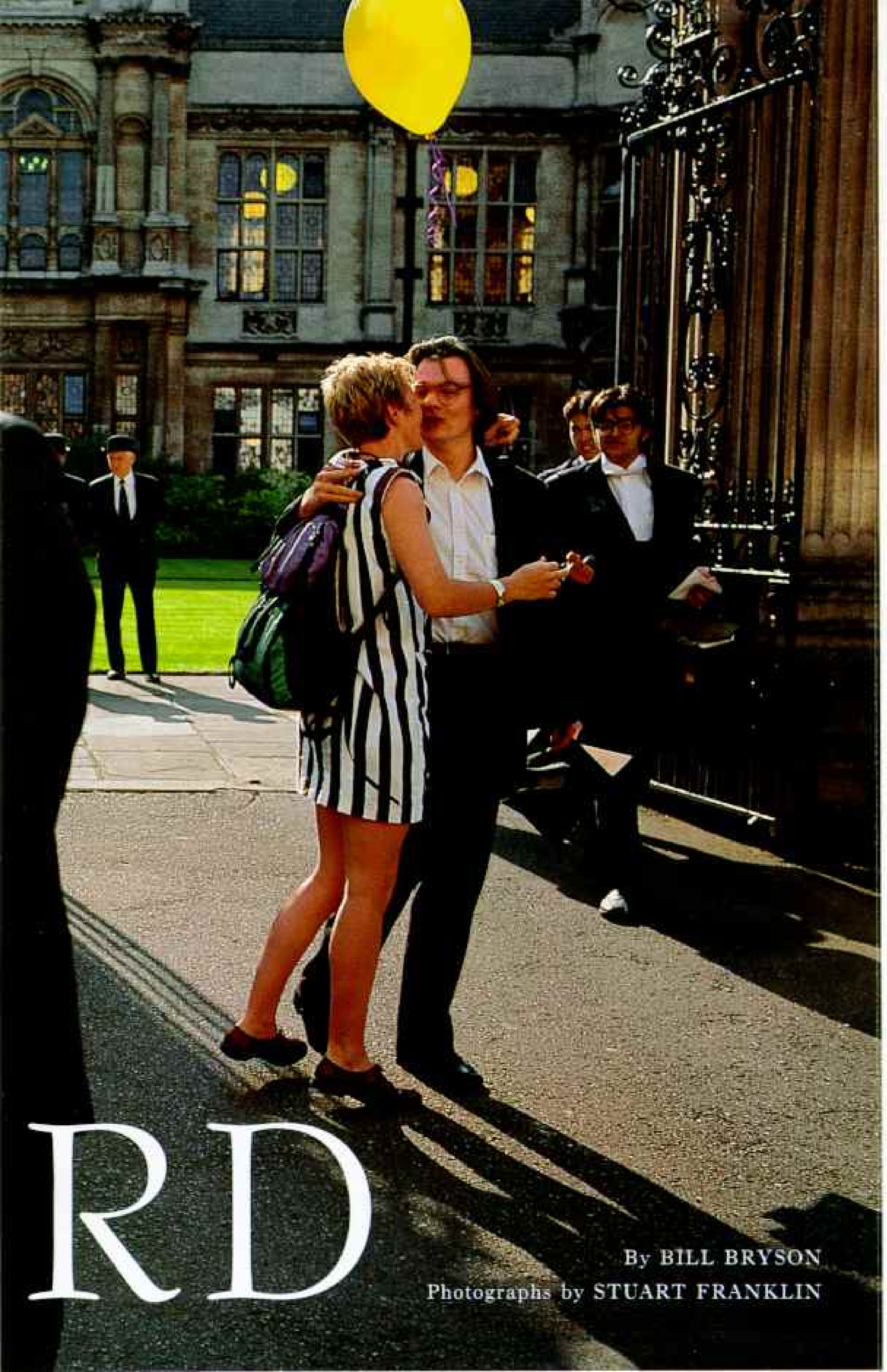
In time, though, the Pleader disappears for good, as do other favorites of mine. It's hard not to grow attached to them and mourn when they vanish. Collops continues to feed by hand and bring her new crop of perfectly miniature babies, whose faces she licks even after they're adolescents. Many of the squirrels take dust baths in the summer as a sort of flea powder. I am watching one now soothing itself in the staggering heat of the afternoon by lying with its belly exposed on the cool shaded flagstones.

Soon it will be autumn, the living larder of the year, when nuts are plentiful and the squirrels start thickening up their fur and growing small tufts behind each ear. Then winter, when the squirrels conserve energy by doing less. On harsh days, they may stay curled up in the nest. Venturing forth, they plow channels through the snow, and bury nuts in the drifts, and sometimes wash their faces with falling snowflakes.

When the snow melts, the yard will be coated in unburied nuts, which will make it clumsy underfoot for me and a real fright for the postman, meter reader, and visitors. They've known me to stand vigil over dying sphinx moths and bicycle for nearly a mile at the exact speed of a flock of finches flying overhead. Still, there's no explaining my squirrel mania to the unbesotted. But that's a small price to pay for a front-row seat at one of life's little operas. □

When even the police look like prime ministers, then you know you're in Oxford, home of Britain's oldest university. Known as bulldogs, security men stand watch by the Examination Schools during finals.

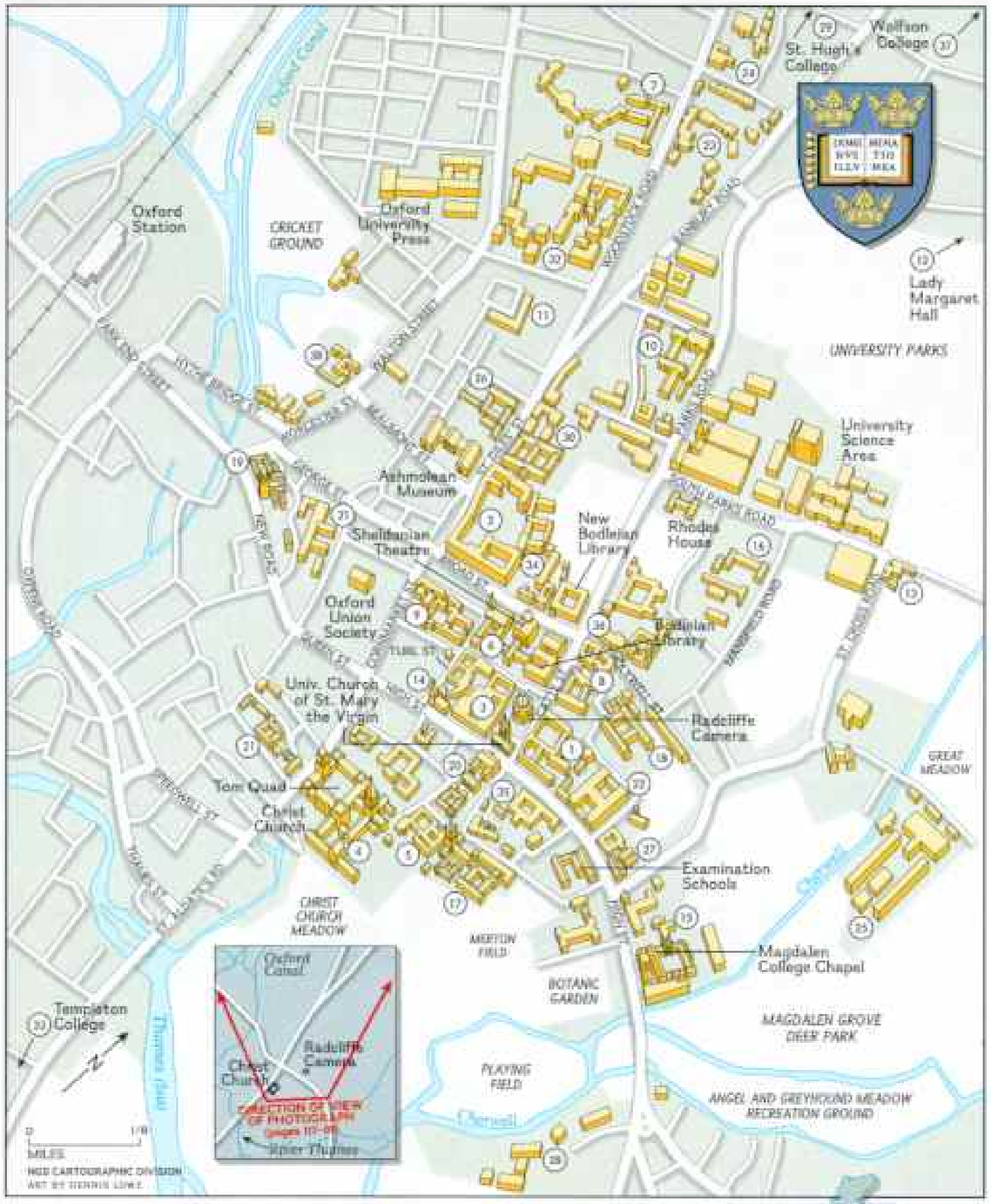
The Style and Substance of OXFO



RD

By BILL BRYSON

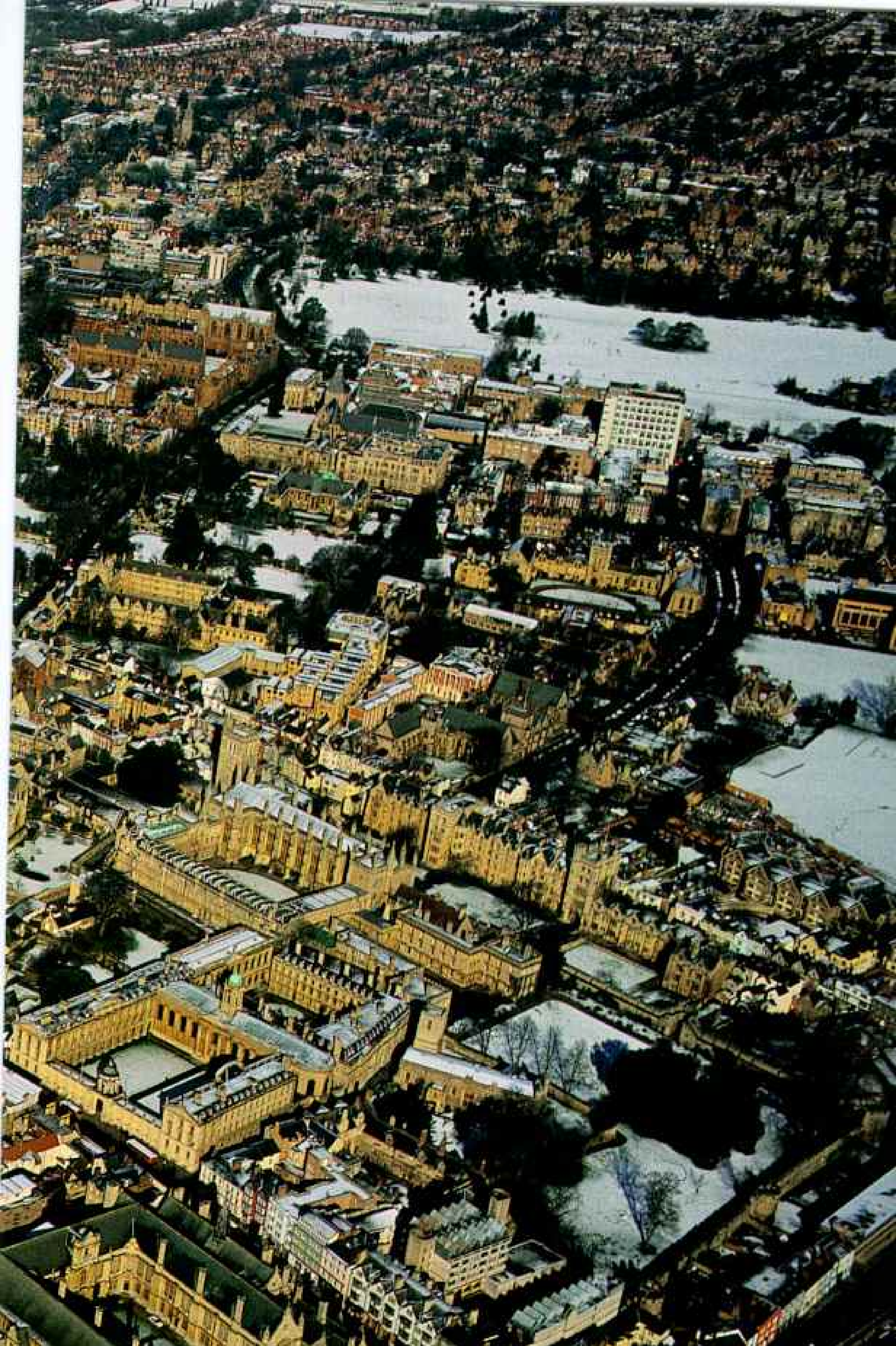
Photographs by STUART FRANKLIN



Colleges of the University of Oxford

1. All Souls College
2. Balliol College
3. Brasenose College
4. Christ Church
5. Corpus Christi College
6. Exeter College
7. Green College
8. Hertford College
9. Jesus College
10. Keble College
11. Kellogg College
12. Lady Margaret Hall
13. Linacre College
14. Lincoln College
15. Magdalen College
16. Mansfield College
17. Merton College
18. New College
19. Nuffield College
20. Oriel College
21. Pembroke College
22. The Queen's College
23. St. Anne's College
24. St. Antony's College
25. St. Catherine's College
26. St. Cross College
27. St. Edmund Hall
28. St. Hilda's College
29. St. Hugh's College
30. St. John's College
31. St. Peter's College
32. Somerville College
33. Templeton College
34. Trinity College
35. University College
36. Wadham College
37. Wolfson College
38. Worcester College

Gothic time capsule, a snow-sprinkled Oxford (foldout) preserves the air of a time when medieval scholars sought to cloister themselves in fortress-like walls around interior quadrangles. Oxford's academic history probably began in 1167 when a group of students and masters took up residence in the prosperous trading town. The university today comprises 38 colleges and some 15,000 students—a modest number for such an important institution.



ALONG OXFORD's busy Broad Street, where groups of sightseers move in amoeba-like clumps and cyclists pass with a tinny clatter, there stands a darkly Gothic building, a small doorway at its base.

This is the entrance to the Balliol College porter's lodge—a kind of combination mail room, information clearinghouse, and checkpoint. As in most of the 38 colleges that make up the University of Oxford, one wall of the lodge is given over to a bulletin board containing a blizzard of announcements.

Waiting for a professor one day, I passed the time by glancing through them. "Master's Handshaking will take place in the Dining Room of the Master's Lodgings. Please wait in the passage outside," said one. Another, more cryptically, announced: "Lagrangian Mechanics—Saturday 11 a.m." A third stated: "RFC 1st and 2nd XV practice Thurs. 2 p.m." Perhaps 50 such notices were pinned to the board, all dealing with some important component of college life, and it occurred to me, as I stood there idly looking them over, that I couldn't truly understand a single one. It is a feeling you soon grow used to in Oxford.

For 800 years the University of Oxford has been polishing minds and confounding outsiders in roughly equal measure. Thanks to a uniquely British blend of well-honed tradition, first-rate scholarship, and, often, inspired eccentricity, it is in almost every sense a place apart—a university where a college founded in 1379 is called New College; where another, Brasenose, is named for an ancient door knocker (a "brazen nose"); where a third, Oriel, revels in the full formal title "The Provost and Scholars of the Blessed Mary the Virgin in Oxford, Commonly Called Oriel College, of the Foundation of Edward the Second of Blessed Memory, Sometime King of England."

It is a place where students generally aren't required to attend lectures, don't receive grades, seldom study anything outside their chosen subject, and take just three sets of exams during the course of their college careers—"one to get in and two to get out," as one alumnus drolly told me.

"Nothing at Oxford is ever quite like any experience you've had before," says one academic. "I remember remarking to a colleague, after I had been here for a few months, that I didn't think I was ever going to understand how it all worked, and he said, 'Oh don't worry, nobody does.' And, you know, he was right."

"There are more rules and traditions than you can imagine," Owen Sheers, a cheerful but slightly shell-shocked-looking first-year student, told me toward the end of his first week in New College. "At my college you dress one way if you go to the first sitting of

Proper Oxonians, members of the Stoics, an exclusive dining club, prepare for their annual repast at Christ Church, where dinner jackets are de rigueur. Despite Oxford's history as an academic powerhouse, some have seen the university's main function as a finishing school for what has been called "an advanced and subtle civilization." Others dismiss such pretension. "I was a modest, good-humoured boy," wrote English critic Max Beerbohm. "It is Oxford that has made me insufferable."

BILL BRYSON, a native Iowan with a soft spot for England, was impressed to find that Oxford dons speak about their colleges almost as warmly as about their dogs. STUART FRANKLIN, a frequent contributor, is originally from London but has lived in Oxford for eight years.

dinner, another way if you go to the second. It's *very* confusing."

A bewilderment of tradition is perhaps an inevitable consequence of a place so deeply steeped in history. Few provincial cities anywhere are more crowded with incident and achievement. In a short stroll you can pass the house where Edmund Halley discovered his comet; the site of Britain's oldest public museum, the Ashmolean; the hall where architect Christopher Wren drew his first plans; the pub where J.R.R. Tolkien scribbled notes for the Hobbit trilogy (it stands opposite the pub where Thomas Hardy made similar preparations for *Jude the Obscure);* the track where Roger Bannister ran the first sub-four-minute mile; the meadow where a promising young mathematician named Charles Lutwidge Dodgson refined *The Formulae of Plane Trigonometry, An Elementary Treatise on Determinants* and—oh yes—a children's trifle called *Alice's Adventures in Wonderland.*

Walk down the broad and curving High Street, thought by many to be the most beautiful in England, or through the maze of back lanes that wander among the golden, age-worn college buildings, and you follow in the footsteps of Samuel Johnson, Adam Smith, Edward Gibbon, Jonathan Swift, John Donne, Roger Bacon, Cardinal Wolsey, Oscar Wilde, Graham Greene, Evelyn Waugh, T. S. Eliot, C. S. Lewis, Percy Bysshe Shelley, Indira Gandhi, Margaret Thatcher, and Bill Clinton, to name just a few who have worked and studied here.

Oxford is, of course, more than just an ancient seat of learning. Beyond its medieval

heart, it is a sprawling town, fringed with factories and housing developments, home to 120,000 people and long an important center of the British car industry. But it is the university, with its 15,000 students, dozens of colleges, and accumulated museums, houses, churches, libraries, gardens, parks, and offices, that dominates the look and temperament of the city, fills its core with bookshops, pubs, bicycles, and scholars, and suffuses the whole with a weighty sense of learning.

IT HAS BEEN LIKE THIS, more or less, since the 12th century, when scholars in holy orders, forbidden by King Henry II to study in Paris, began gathering in Oxford, a trading center on the Thames 55 miles from London. They banded together in halls of residence loosely modeled on monasteries, each under the control of a master who directed their studies (hence the modern master's degree). Everywhere you turn in Oxford you find echoes of the university's ecclesiastical roots, from the names of many of the colleges—All Souls, Jesus, Trinity, Corpus Christi—to the lingering use of Latin in university rites and titles.

Almost from the beginning there were tensions between locals and scholars, or "town and gown" as the two poles of Oxford life are still known. One dispute in 1209 grew so ugly that many scholars decamped to Cambridge, where they founded a rival university. An argument in a tavern on St. Scholastica's Day 1355 led to riots in which townspeople ran wild. "Such Scholars as they found . . . they killed or maimed, or grievously wounded," reported a contemporary account.

Despite these temporary setbacks, many of Oxford's halls gradually evolved into more complex entities called colleges, though always retaining their semi-monastic air. Even now each Oxford college remains a little world unto itself, private and cloistered, with its own dining halls, common rooms, chapel, libraries, endowments, debts, treasured quirks, and private argot. At Christ Church the head is called a dean, but his counterpart at Lincoln is a rector, at Merton a warden, at Balliol a master, at Hertford a principal, at Oriel a provost. At most colleges the academics are known as fellows, but at Christ Church they are called students. Elsewhere students are called students, though at Merton they are called postmasters, and at Magdalen (pronounced MAWD-lin) they are sometimes demies.

"In terms of institutional decision-making,

Bucking the high rents that keep many students in genteel poverty, Chris Thiessen brought his boat, Zorba, to town. "But it's really about freedom," says the Lincoln College undergraduate, who thinks life in the college "too conservative."

A small but muscular presence on the Thames, women compete in Eights Week, a regatta named for the tally of oarspersons per boat. Most colleges have been coed since 1979. The university's enrollment is now 40 percent female, its faculty 17 percent.

the collegial system isn't always a boon to efficiency," concedes Peter North, principal of Jesus College and vice-chancellor of the university—in charge of day-to-day affairs for the four years he holds the office. "But the plus side is enormous. Colleges develop distinct identities, and because they are small—most have no more than 300 to 400 students—they have a wonderful intimacy. Instead of being lost in a monolithic organization, students become part of a small community."

An agreeably favored community, he might have added. Dr. North had brought me to the Jesus College Senior Common Room, or staff room. Like most such rooms at Oxford, it was comfortably elegant, the architectural equivalent of a fine port—rich, dark, woody, refined—and a visible reminder that Oxford enjoys not just a wealth of tradition but a tradition of wealth. It is easy to see why, long after it ceased being demonstrably aristocratic and rich, it retains a reputation for both.

"That is a ghost image," insists the Very Reverend John Drury, Dean of Christ Church, architecturally the grandest of Oxford colleges and one indelibly associated with aristocratic breeding since long before Evelyn Waugh consolidated the image in the novel *Brideshead Revisited*. "It's true that students used to have their own servants and lead a life of considerable privilege, but that hasn't been the case for a very long time."

"Oh yes, things have changed almost out of recognition," agrees Ted East, who has been observing Oxford life since 1950, first as a member of the city police, where he rose through the ranks to become superintendent, and later as the head of the university's own small police force, whose officers—notable for their black suits and derby hats—are affectionately known as bulldogs.

Until about 1970, East explained, there was far more of what might be called institutional eccentricity. Proctors patrolled the streets nightly, dressed in gowns and mortarboards, accompanied by bulldogs. Students were subject not only to curfews but also to a set of arcane statutes dating back in some instances to the Middle Ages and covering everything from the lighting of fires to the carrying of bows and arrows.

Then in the early 1970s Oxford made a sudden leap into the 20th century. It discarded many of the more archaic rules, began a concerted effort to attract more students from state schools, and, most strikingly, became

Evoking Oxford's legendary track records—Roger Bannister broke the four-minute mile here—a runner skirts Tom Quad of Christ Church. Epitome of Oxford's great colleges, Christ Church is the alma mater of 13 British prime ministers.

Humbled and confounded, Tiernan O'Corrain fields hard questions from his literature tutor, Kate Flint, who found his paper on ideology "jolly obfuscatory." An Oxford tradition, tutorials foster intellectual risktaking and independence.

coeducational. Since 1878 Oxford had had a sprinkling of women's colleges, but not until 1974 did individual colleges begin accepting students of both sexes. Today just one college, the all-female St. Hilda's, founded in 1893, remains single sexed.

"The university has become much more egalitarian and forward-looking, which is all to the good, of course," says East, "but it has also lost some of its color. For one thing, you don't see many pranks any longer. Students used to get up to all kinds of stunts—reversing all the one-way signs in town or putting chamber pots on the spire of the Radcliffe Camera."

The Radcliffe Camera, one of the university's central buildings, towers some 150 feet above a cobbled square. East read my mind. "The mountaineering club," he explained with a smile.

"There was a famous case of a student dressing up in the regalia of an Eastern potentate and being wined and dined by various colleges before the charade was uncovered. But I'm afraid those days are over. Academic life has become far more competitive and intense. There isn't much room left for high jinks."

One Oxford institution that hasn't suffered from the drive for ever greater efficiency is the costly and labor-intensive system of instruction known as tutorials. Under it a pair of undergraduates, or sometimes an individual student, normally meets once a week for an hour with a senior academic. One student will read and then defend—often in the face of a fairly merciless grilling—an essay that he has spent the week researching and writing. At the next session it will be the other student's turn to read and parry.

One chilly November afternoon I found my way to the office of Richard Jenkyns, a classics don at Lady Margaret Hall, who had given me permission to sit in on a tutorial with second-year student Katy Cawkwell. They began by going over a passage of Greek translation that Jenkyns had assigned—"something attributed to Euripedes but probably not by him," Ms. Cawkwell explained—and then moved on to the meat of the tutorial, the essay, that week examining the question "Is Antigone the heroine of Sophocles' *Antigone* or do Creon and his tragedy play a more central role?"

With fingers twined, Dr. Jenkyns listened thoughtfully as Cawkwell read in a soft, earnest voice. Her prose was clear, her arguments carefully structured. When she

finished, some 20 minutes later, he nodded appreciatively and offered general praise but then began probing in a tone that was almost apologetic, as if begging excuse for his own confusion: "I wonder if you could tell me a *bit* more about the moral ambiguities at play here?" and "I must confess I wasn't *entirely* clear about your view on the antithesis between Creon and Antigone. Could you perhaps elucidate?"

As Cawkwell gamely restitched the arguments that Dr. Jenkyns seemed in constant danger of unraveling, I thought of a remark made to me earlier by another don, Kate Flint (left): "The strength of the tutorial system is that it's almost impossible to be lazy under it. You can't slump down in your seat and hope you'll go unnoticed." The besieged Ms. Cawkwell was certainly at no risk of that. After nearly 30 minutes of courteous cut and thrust, the conversation briefly turned to the topic of the next week's paper, with Jenkyns offering some very general advice on sources—"There's a good commentary by Dodds. Vickers is also interesting"—and then Ms. Cawkwell, cradling books, was off into the wintry darkness, into the jumble of buildings that is the university.

BECAUSE OXFORD'S COLLEGES grew up piecemeal over centuries, the modern city is a confusing mass. Colleges seem to have been set down at random and to have grown in erratic, unpredictable directions, like the pattern of words on a Scrabble board. With no central focus, no obvious heart, the university seems to be everywhere and nowhere. It is easy to sympathize with the addled-looking tourist I overheard asking a policeman in a politely strained voice, "Pardon me, but where exactly *is* the campus?"

Though not a private university, Oxford often acts like one. Its gardens and quadrangles, its playing fields and libraries, are, for the most part, for the benefit of college members. Although most colleges open their grounds to visitors for part of each afternoon, outside those hours they take on the aspect of walled and unwelcoming compounds. With scores of university labs, libraries, lecture rooms, and offices shoehorned into the heart of the city, an outsider spends a lot of time being reminded of his condition.

Says Tim Blott, editor of the *Oxford Mail* newspaper: "Frankly, there's not a great deal of love lost between the city and the university. In general, I think, the university is

Following a medieval custom, a convocation of faculty and alumni turns out to elect the university's new professor of poetry. Candidate James Fenton, who began his writing career as a journalist in Indochina, won by a wide margin.

During the Eights Ball at Lincoln College, partygoers celebrate a festive week of boat races with port and helium-filled balloons. Though there are signs of a new sobriety, most Oxford colleges still keep well-stocked wine cellars.

perceived as being rather arrogant and aloof, not really part of the wider community."

Spend a few days in Oxford and you begin to notice a kind of unspoken—indeed, largely unwitting—cultural apartheid at work. Around Turl Street and Catte Street, where the university buildings loom large, you seldom see anyone who is not obviously a student or don, while only a couple of blocks away on the busy shopping street called Cornmarket you seldom get any hint that there is a great university nearby. Much the same sort of division can often be found between pubs, cafés, and shops.

"There is remarkably little interconnection between the two worlds," says a medical doctor who has lived for a decade in north Oxford, an area of large Victorian homes long favored by academics. "If you're not part of the university, you are generally excluded. People will be friendly to you over the garden wall, but they tend not to invite you to their cocktail parties."

In the leafy district of north Oxford known as Summertown there lives a man who understands the hidden tensions and quiet animosities of Oxford life better than most. With his cable-knit cardigan and mild demeanor, you would never guess that Colin Dexter is a man with murder on his mind. In fact, these days he often has time for little else.

Now retired from academic life, Dexter was an Oxford examinations administrator who, "in a moment of total idleness," began writing a murder mystery as a way of whiling away a rainy vacation in the early 1970s. The result was the first of a hugely successful series of crime novels involving the dour, Oxford-educated Chief Inspector Morse and his plodding sidekick Sergeant Lewis.

All of Dexter's novels are based on real locales in or around Oxford. If Inspector Morse orders a pint of Burton ale in the Eagle and Child pub on St. Giles', you can be sure that there is such a place and that it serves Burton. "It means I can go to the pub and pretend I'm doing research," Dexter told me with an easy smile when we met—naturally—in a local pub.

Dexter is well aware that many of the least agreeable characters in his books are dons. "Well, you see, there is a high level of ambition and arrogance among academics—what I call the Oxford disease—which makes them attractive characters for murder mysteries.

"Oxford is an edgy and exhausting place," observed writer Jan Morris. "Her various energies chafe each other, setting up magnetic fields and making sparks fly." Up Broad Street from Christopher Wren's domed 17th-century Sheldonian Theatre, background, a heated exchange reflects those energies—and Oxford's historic tensions. After centuries of conflict between "town and gown," relations between the Oxfordshire city and its university have reached an amicable accord.

They make very satisfying victims." He took a sip of beer and thoughtfully wiped a mustache of foam from his lip. "And even better villains."

At last count Dexter had killed off 68 characters—"including," he added with a hint of pride, "five heads of colleges. Somebody told me he thought that was a bit much. I said it wasn't half enough."

IF COLIN DEXTER'S BOOKS create the impression that the drawing rooms and studies of Oxford are strewn with bodies made horizontal before their time, the reality is somewhat different. "Oxford is actually quite safe—much safer than it was 400 years ago," says Inspector Peter Shepherd of the Thames Valley Police. "In the 16th century there were 60 murders a year

here. Today, with a much larger population, we average about two, almost always the result of a domestic dispute."

These days most police time is taken up with car crimes—breaking into or stealing cars, which has become something of an epidemic in British cities. "If we didn't have cars," says Shepherd, "our crime rate would be halved at a stroke."

The disappearance of cars would also solve what many regard as Oxford's most serious problem—a chronic surfeit of traffic. Along many streets for much of the day the pavements tremble from the weight of passing traffic and the air is suffused with a bluish haze. For the motorist any trip to the center of town is likely to mean a slow creep forward and a frustrating search for a parking space.

"It's a nightmare," concedes Roger Williams, chief transport planner for the Oxfordshire County Council. "Oxford has one of the greatest concentrations of historic buildings in England—900 in the central square mile of the city alone. It has a street network that was clearly never designed for motor vehicles. And it is bounded to east and west by floodplains that cannot be built on. There is simply nowhere to divert traffic."

For the past 20 years, city policy has been to discourage people from driving to the center by reducing the number of parking spaces, raising fees, and implementing an extensive park-and-ride scheme whereby people park at the city's edge and catch a bus in. "We've managed to hold traffic levels steady at a time when traffic volume nationally has increased by 60 percent," said Williams, "but old habits die hard."

Indeed. I asked him how he gets to work. "I, ah, drive," he said, a trifle sheepishly.

Between the sclerotic traffic, the jackhammer din of construction work, and the fearful whizzings of student cyclists, who fly through the streets like stray gunfire, Oxford can seem an alarmingly uncomfortable place. It would be nearly intolerable at times except that scattered throughout the city are a number of portals and passageways through which you have only to pass in order to insert yourself, as if by magic, into another, quieter age.

At the eastern end of High Street, opposite Magdalen College, is one. Step through a gate beside a Roman arch and you find yourself in four and a half acres of carefully composed tranquillity. This is the University of Oxford Botanic Garden, one of the most enchanting, if least known, corners of Oxford.

There, one crisp, sunny morning, I asked a passerby—the only other visitor—if she knew the way to the director's office. "Straight on to the *Tilia cordata,*" she barked, "and left at the *Cornus alternifolia.*"

Thus briefed, I found myself, one minute and an *alternifolia* or two later, in the companionable presence of Timothy Walker, the garden's youthful and enthusiastic superintendent, who—this being Oxford—enjoys the title of Horti Praefectus. "Garden monitor," he translated with a modest grin.

Founded in 1621, the botanic garden is the oldest such garden in Britain and third oldest in the world. It was planned as a physic garden—one specializing in medicinal plants.

"This is the most compact and yet diverse plant collection in the world," Walker said as he took me through a jungly hothouse and out into the formal orderliness of the gardens. "We have 8,000 species, representing 90 percent of the world's plant families."

I asked if a physic garden isn't a touch archaic in a modern university. "Oh no, anything but. Many medicines are still derived directly from plants. A garden like this isn't just a historical curiosity; it's a valuable resource."

Heavenly chords seem to fill Oxford, thanks to the many choral groups that thrive there. Boy sopranos, like those (above) who sing in Magdalen College Chapel (opposite), lend an angelic tone. The Magdalen choir has earned international renown.

It costs £324,000 a year—half a million dollars U. S.—to run the botanic garden, and it is just a small corner of a large and multifaceted institution. "Oxford is a very expensive place," says Henry Drucker, an American academic who is a longtime resident of Britain. In 1986 he came to the university to set up a fund-raising campaign—a novelty in Britain, where government traditionally provided nearly all university funding.

"Oxford had no experience with this sort of thing. It didn't even have a list of its alumni," Drucker says. With the help of the individual colleges, he tracked down 85,000 former students, drew up a list of potential institutional donors, and began the serious business of soliciting funds.

"After an American firm did a study, they told us we could realistically hope to raise 220 million pounds—way beyond my wildest dreams." In the event, when the campaign closed in late 1994, the university had raised

Culmination of the Oxford experience, degree ceremonies in the Sheldonian Theatre are conducted in Latin and cast in arcane ritual. As graduates are presented to the vice-chancellor, proctors doff and don their hats.

more than 341 million pounds (a third of it from North America).

It seems an enormous sum, but the University of Oxford soaks up money. It has to maintain not only all the educational infrastructure of a great teaching establishment but also eight centuries of accumulated marginalia, like the botanic garden, a church, a cathedral, a theater, and three museums. Some of these peripheral interests more than pay their way. Oxford University Press, the world's largest university publisher, contributes a substantial but undisclosed sum to running costs. But most others are a cash drain. The University Church of St. Mary the Virgin, for instance, is the most visited parish church in England, but its 300,000 annual visitors leave just £8,000 a year in the collection boxes—a fraction of the church's running costs.

Off on a spree, students from St. Edmund Hall celebrate an honored alumnus, Chief Oronhyatekha, a Canadian Mohawk who attended "Teddy Hall" in the 19th century. Such antics in old Oxford sometimes verged on hooliganism, raising the wrath and retribution of Oxford citizens. While modern larks are mostly harmless, they can draw frowns —or worse—from the deans. Yet tweaking authority is itself one of Oxford's most abiding and fiercely guarded traditions.

NOWHERE does the alarming costliness of maintaining ancient fabric become more evident than in what is perhaps the university's single most important institution, the great Bodleian Library. Dating from the 15th century, the Bodleian is one of the oldest and largest libraries in Europe, and it feels it—in both good ways and bad.

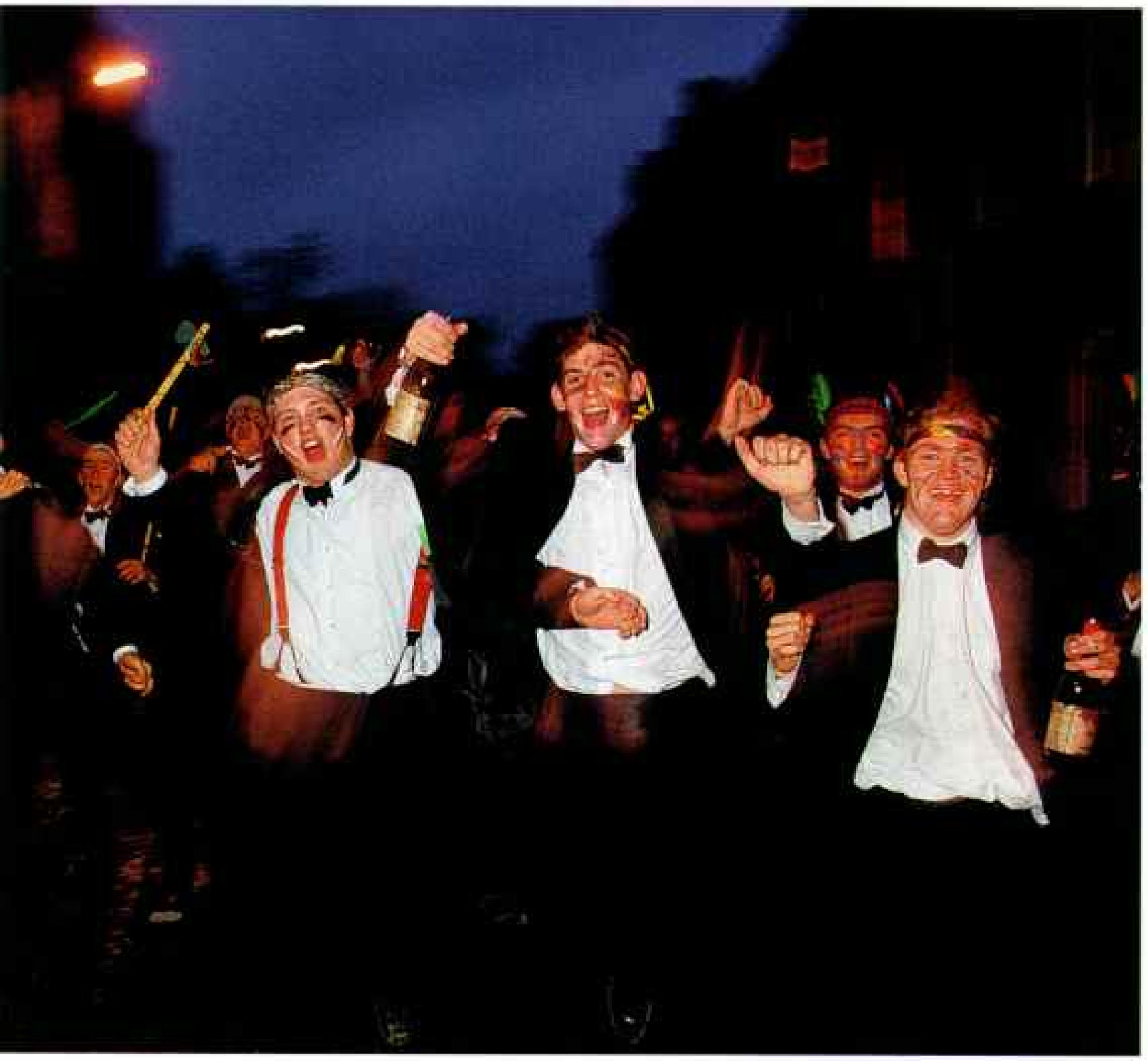
In the reading room known as Duke Humfrey's Library, with its leatherbound books, coats of arms, and ancient beams, scholars work in an environment barely changed in 500 years but for the discreet addition of a little—a very little—electric lighting. They must still take an oath promising, among other things, not to light a fire in the building. Like all those before them, they are not allowed to remove books from the building.

Because of its singular antiquity, the library has a labyrinthine catalog system, unlike any other in the world. To order a book, a reader needs to know that PS signifies the Slavonic Reading Room, while BGEO refers to the first-floor map room of the New Bodleian Library. Because most books are cataloged only by author and not by subject, there is no effective way of searching a subject.

Because of the immensity of the library—it owns 6.5 million volumes and requires two miles of new shelving each year—it sprawls across several buildings. Readers, therefore, must order books from a central desk and wait for them to be delivered—a process that seldom takes less than two hours.

"A book can be handled as many as 13 times in getting it from the shelf to a central collection point, on to the reader, and finally back to the shelf again," says Charles Mould, library secretary. "Obviously there must be more efficient ways of organizing things, but we are stuck with two intractable features: very old buildings and very tight budgets."

Like many British institutions, the Bodleian finds itself having to run ever faster just to stand still. "Between 1986 and 1991 our funding fell by 11.5 percent," Mould says. "At the moment, the university funds just over 60 percent of our annual budget of 11 million pounds. The rest has to be made up through private donations or by going without."



Others in the university fear that government squeezes could result in more than discomfort. "Britain is the only nation in the developed world spending a smaller fraction of its wealth on research and development than ten years ago, and it shows," says Denis Noble, a professor at Balliol College and one of the world's leading researchers into heart physiology. "Until around 1980 Britain was among the top nations in Nobel Prizes per capita. Since then we've won hardly any.

"The government is increasingly exerting pressure on universities to come up with research with practical applications, but research doesn't always work that way. Consider the case of Michael Faraday. It's been estimated that his research into electromagnetism led to the creation of industries worth more than the total value of all the companies listed on the London Stock Exchange. Yet at the time it seemed to have no practical value."

No one is now seriously suggesting that Oxford's preeminence is under threat or predicting its decline into a middle-rank university. But then, as Denis Noble points out, 40 years ago no one dreamed that Britain would ever cease to be a great manufacturer of ships, cars, and airplanes.

"You may get away with it for a while," he says, "but if you cut corners and fail to invest adequately in the future, as Britain did with most of its manufacturing industries in the 1950s, the unthinkable will eventually happen."

What a great loss that would be. Other nations, after all, can build ships and planes, but no one will ever make another Oxford. □

ACME PHOTO

■ FROM THE ARCHIVES

Dressed for the War Effort

Does anyone remember the best-dressed squirrel in the world?

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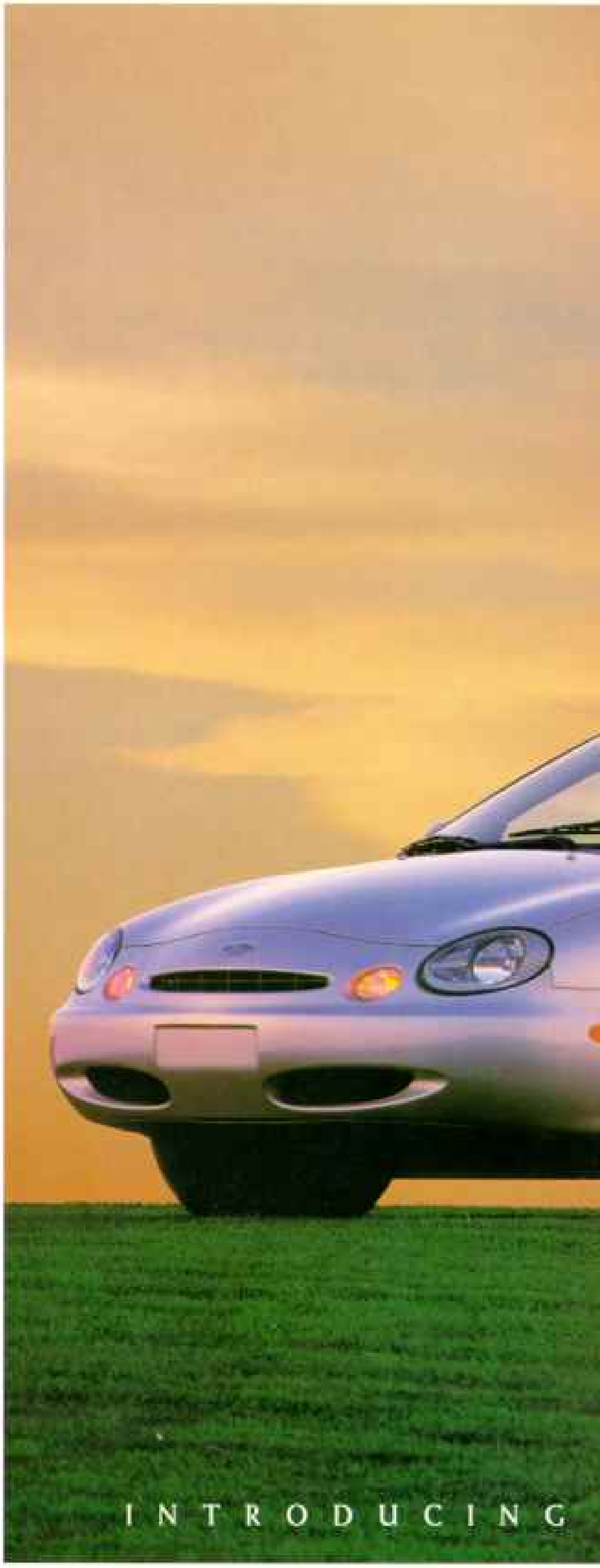

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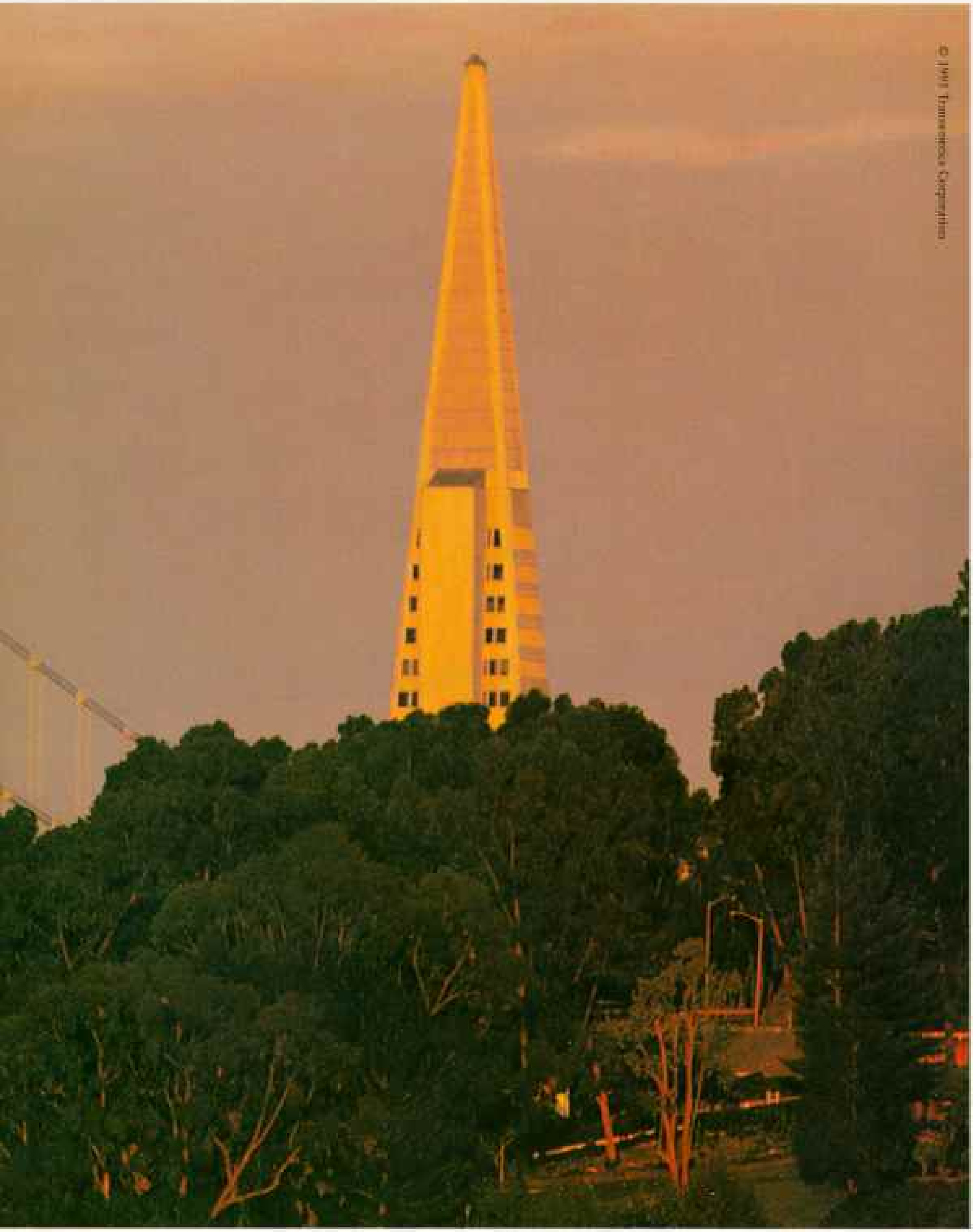

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NATIONAL GEOGRAPHIC

NOVEMBER 1995

Departments

The Cover

Skipjack tuna glisten at a Manila market. Photograph by Robb Kendrick

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NATIONAL GEOGRAPHIC

Behind the Scenes

Good-bye Boab

THE LIGHT in Northwest Australia was never quite right to shoot the solitary boab, says photographer Sam Abell, who had admired the tree for days. Suddenly a storm blew in, and roiling clouds made a dramatic backdrop (January 1991).

When author Harvey Arden revisited Australia two years later, he thought Sam would enjoy a photo of the tree beside his hard-won image. But the boab had been struck dead by lightning. Harvey took this picture anyway. Nothing remains of the tree today.

Cuts Both Ways

THE LARGEST scissors manufacturer in the world may end up doing business with one of the smallest because of our April article on Saigon. It featured Nguyen Manh Tuan, the owner of the small factory, here lecturing his son on quality control.

Mike Vierzba, a Fiskars vice president for consumer products based in Madison, Wisconsin, read about Tuan's scissors and wanted to know more about the entrepreneurial spirit—and possible business connections—of the former South Vietnamese Army officer. Vierzba visited Tuan's Saigon factory last spring and is now looking into a distributorship deal between their companies.

"They are like the Prince," says Tuan of the larger firm. "We are like Cinderella. In a fairy tale, such a marriage can happen."

HARVEY ARDEN (TOP); KAREN KASMAUSKI

Flying Fish

IN 27 YEARS as a staff photographer, Jim Stanfield admits that his most embarrassing moment happened as he was covering the Tokyo fish market for this issue.

To photograph a tiny, crowded café, he placed a ladder across a counter and climbed up to rig a remote camera on ceiling pipes. As he descended, his foot clipped a cauldron and sent a hundred dollars' worth of pickled horse mackerel flying. Jim blushed, cleaned up the mess, paid for the damage, and got his picture (page 53).

We thought of everything.

Chapter Five

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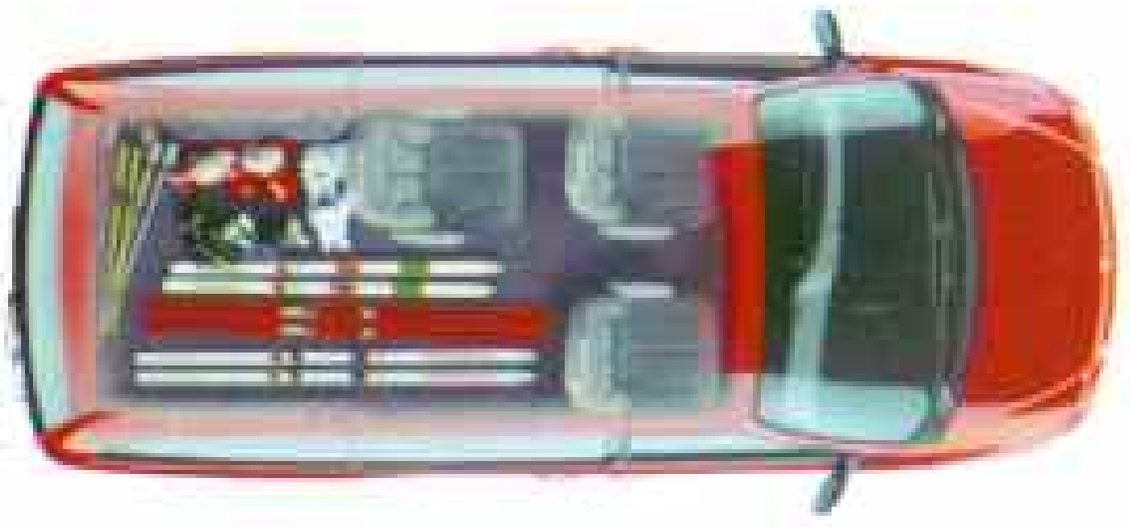

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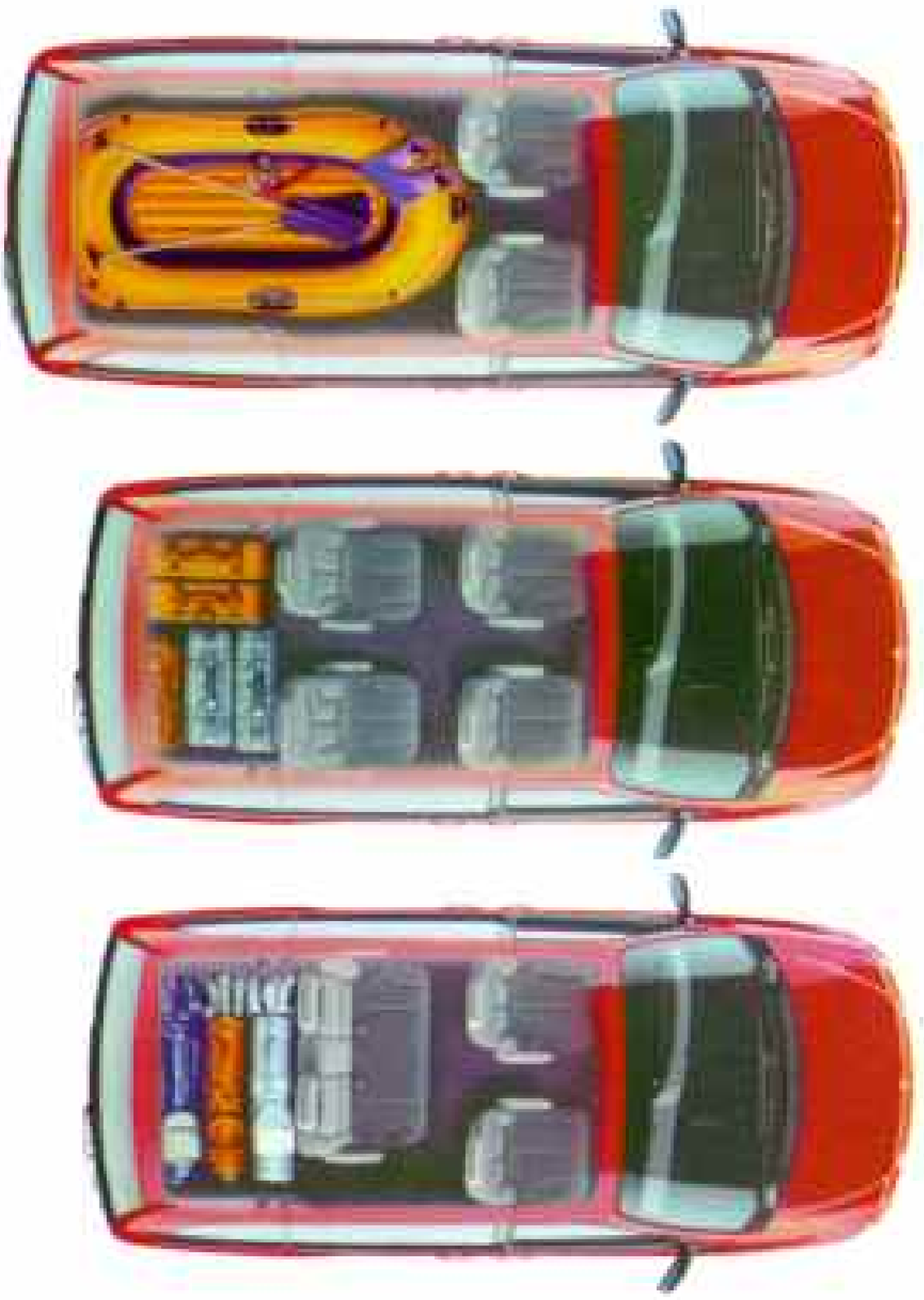

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Always wear your seat belt.

More Fun Than . . .

HOW DID WE GET a hundred chimpanzees into Boston's Athenaeum library for last month's "Information Revolution" article?

Photographer Louie Psihoyos shot the room empty (top left). In Los Angeles he hired Archie, a chimp with a lengthy film and television résumé, who spent two days posing at a prototype Apple computer with a supermodel's aplomb. Finally, computer artist Lee Varis digitized all photographs, then lengthened the table and "composited" a hundred different images of Archie around it, adding appropriate shadows and reflections. The result (right) is more fun than a library full of monkeys. And cleaner too.

ALL BY LOUIE PSIHOYOS

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Which makes us very happy. But not for long.

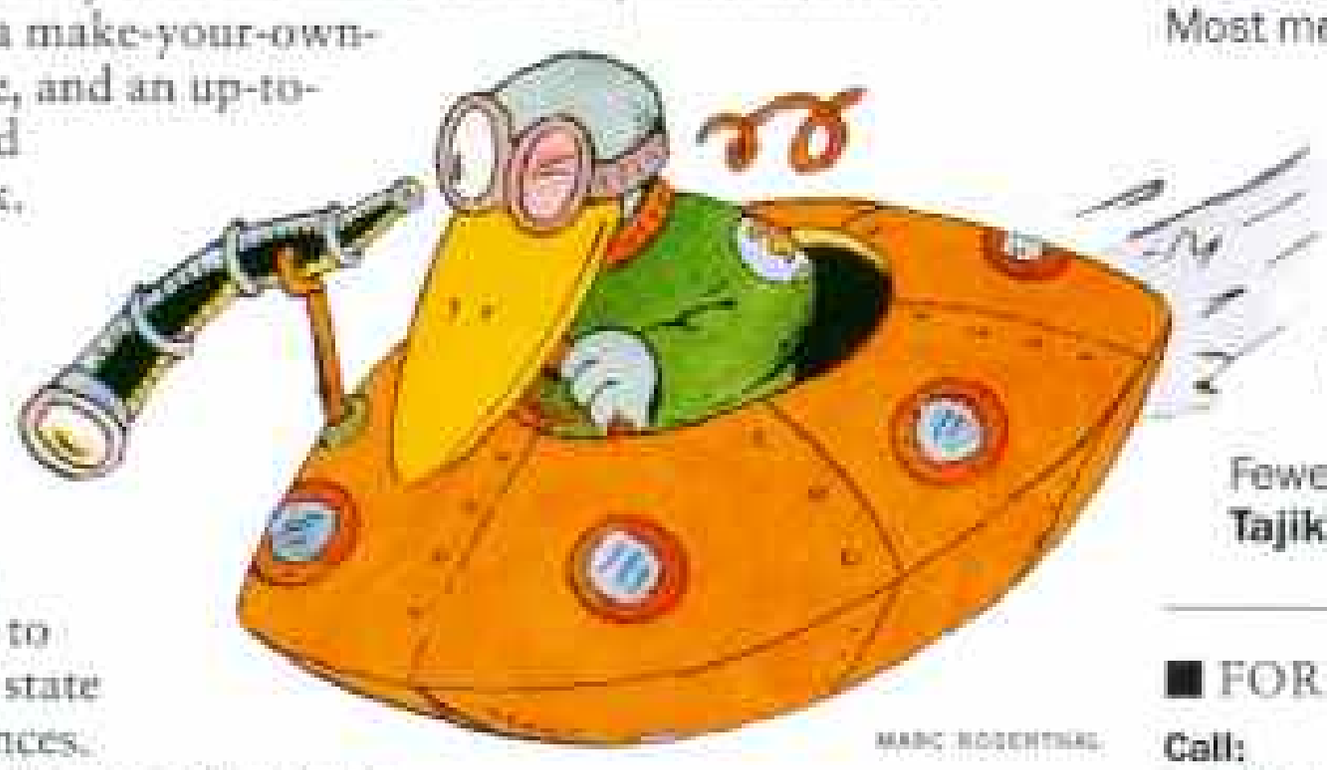
PHILIPS

Geopolitically Correct

THE WORLD KEEPS TURNING, and our cartographers keep up with it. For the second revision of the sixth edition of the Society's *Atlas of the World*, a map of Kazakhstan (above) is losing its *b*. To reflect its recent independence, the Central Asian republic abandoned the transliterated Russian spelling in April. Nearly 3,500 place-names have been changed since the atlas's last revision in 1992. Also added: the route of the English Channel Tunnel, opened in 1994, the Aral Sea's shrinking shoreline, and the new nations of Eritrea and Palau. Adjustments have been made to the borders between Oman and Yemen and between Saudi Arabia and the United Arab Emirates.

Presenting "Earth 2U, Exploring Geography"

THIS BIG-BEAKED BIRD will lead young museum-goers to adventure in an exhibit called "Earth 2U, Exploring Geography," opening November 15 at Explorers Hall in our Washington, D. C., headquarters. Visitors receive special question-and-answer "passports" to be stamped as they tour the hands-on show, which features walk-in globes, a make-your-own-earthquake table, and an up-to-the-second world population clock. Instructional materials keyed to the exhibit, including games, lesson plans, and teaching props, will be available to schools through state geographic alliances.



MARC ROSENTHAL

Funded by Nissan Motor Corporation U.S.A. and co-sponsored by the Society and the Smithsonian Institution, "Earth 2U, Exploring Geography" will travel to 39 cities during the next five years to spread the word that geography is fun.

■ THE EXHIBIT SCHEDULE INCLUDES:

Nashville, TN Mar. 1996; **Orlando, FL** June 1996; **Chicago, IL** Oct. 1996; **Logan, KS** Feb. 1997; **Jersey City, NJ** Nov. 1997; **Kalamazoo, MI** Feb. 1998; **Fort Worth, TX** Oct. 1998

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Forum

Ndoki

I had given up hope that a sanctuary such as Ndoki in central Africa was still in existence (July 1995). The great apes are all that is left of the family from which we sprang. Are we enlightened enough to preserve them? The chimps and gorillas of Ndoki do not belong to any political subdivision of our troubled world; they are a common inheritance that we have a duty to protect so future generations can learn, and wonder, and be proud.

JOSE HERCULANO
Algueirão, Portugal

An example of the GEOGRAPHIC at its finest. From the safety and comfort of my air-conditioned home I could see the first encounter a chimp had with humans, an elephant charging, a leopard in search of a meal. It would not surprise me if a future issue has a real picture of *mokélé-mbembé*.

BRAD C. PAPE
Lafayette, Indiana

I was born in Mozambique and have been a Society member since 1985. I find that the GEOGRAPHIC continues to portray Africa as a continent of animals. Africa was colonized for its resources and beauties, not its animals. Today there are many beautiful centers in Africa full of cultural and educational institutions, as well as ample development being undertaken, which you could write about rather than just promoting animals.

JAIME M. KHAMBA
Brooklyn, New York

My personal thanks to the GEOGRAPHIC and the entire crew that endured the hardship necessary to bring out this wonderful story of life on earth. The photography was breathtaking.

CHERYL MARTIN
Douglasville, Georgia

Burma

In painting a true picture of conditions in this resource-rich land driven to poverty by a repressive regime, you have taken a giant stride. This should encourage tourists to shy away from Burma, where dollars spent only entrench the generals.

By the way, you say that the Padaung women's neck rings (page 96) are "added one at a time from childhood." Actually, two rods of brass and gold alloy are coiled around a girl's neck, with a break at about the seventh rung above the clavicle to permit head mobility. As the girl grows taller, larger sets of coils replace outgrown ones.

U KYAW WIN
Laguna Hills, California

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Bayer is an international, research-based company in health care, chemicals, and imaging technologies.

In last week's newspaper I came upon an article about the release of Aung San Suu Kyi (pictured on page 91) from house arrest where she had been since July 20, 1989. This would not have interested me at all if I had not read the Burma article. My favorite articles are the ones that open my eyes on the world, giving me not only a geographic, but also a human, point of view.

PATRICK HAMEL
Ste.-Julie, Quebec

I do not believe that your article presents a fair, balanced view of that little-understood country. Fifty years ago I served with the OSS working with the Kachins to clear out the Japanese and reopen the Burma Road. Last March I made a return pilgrimage with ten other OSS veterans. The Myanmar government was very helpful and even provided transportation to the northern area of Myitkyina so we could revisit our campsites. We traveled in cities without restraint. We saw new schools and medical centers, Baptist churches and Buddhist temples. We met with leaders of the State Law and Order Restoration Council. The country does not practice democracy, but as an officer said, "You place consideration of the individual above that of the nation; in Myanmar we place consideration of the nation above that of the individual."

HARVEY S. SUSSMAN
Delray Beach, Florida

Many years ago Taw Sein Ko, the director of archaeology in British Burma and a Chinese outsider, gave his opinion that the king and his officials and service people operated as an occupying army in a conquered country. It is interesting that Burma still gives the same impression to Joel Swerdlow. Burma is back in the time of the Konbaung dynasty (1752-1885), with power developed from a mutual dependence between the top brass and a widely distributed, slightly privileged but isolated body of armed supporters, whose advantages depend upon the system continuing.

L. E. BAGSHAWE
Durham, North Carolina

Several years ago I canceled my subscription; I grew tired of the beautiful articles on beautiful people that did not correspond to what I saw in Third World countries. I hope Joel Swerdlow's article represents a shift to a more realistic portrayal. Politics is not separate from life and as such should be included in a portrayal of life.

ANNE S. OLIVER
Washington, D. C.

Banff National Park

Author Jon Krakauer struck a raw nerve in many Canadians with his "Rocky Times for Banff" in the July issue. That's understandable. Canadians are no different from anyone else when it comes to being criticized. We don't like anyone telling us what's wrong with our "house." Especially outsiders.

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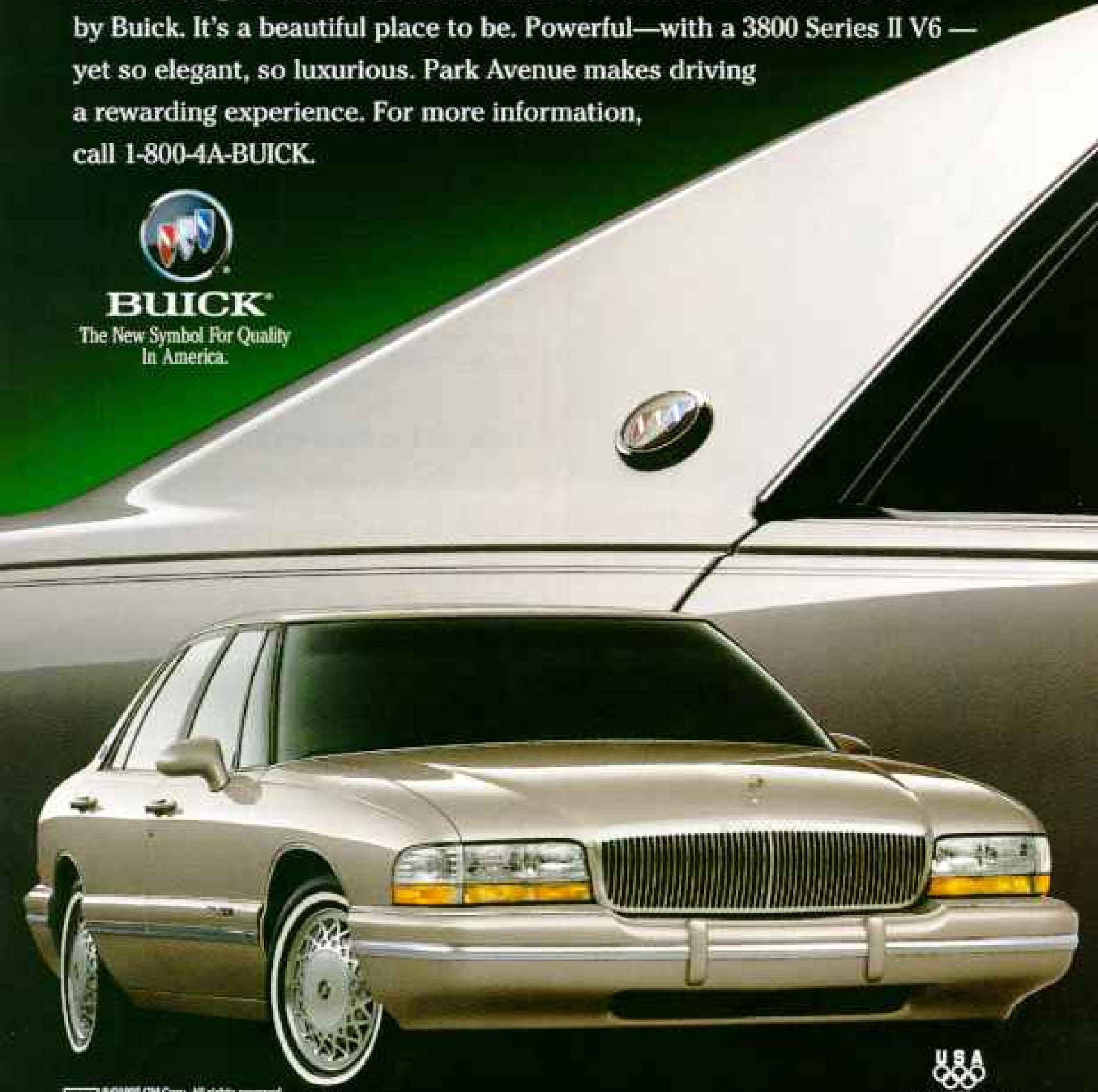

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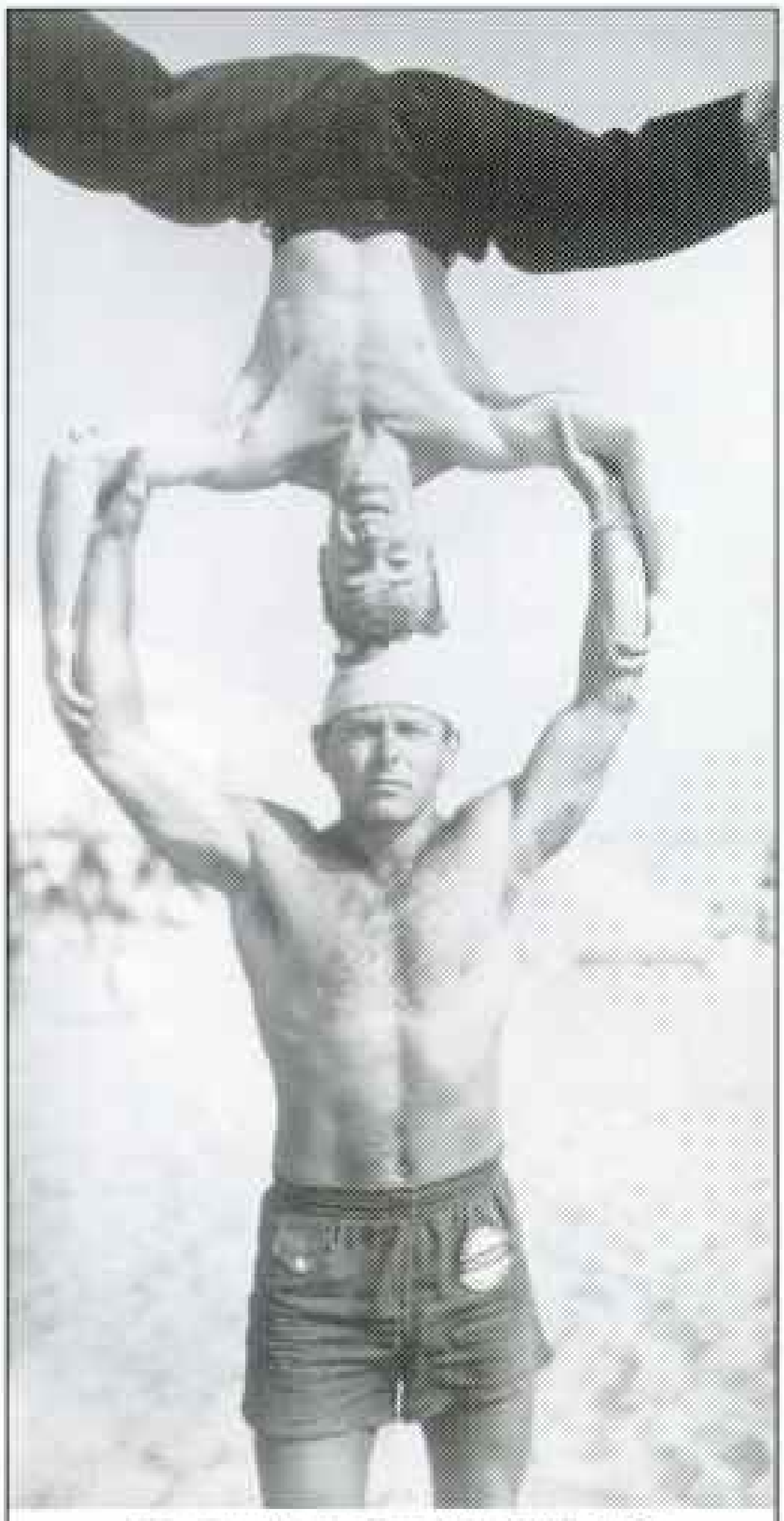

Headstand, Muscle Beach, Santa Monica, California, 1954
LARRY SILVER

Thank goodness you had the fortitude to do so. Instead of ignoring the problem and pretending all is well, we are forced to confront reality. Are we proud of it? I think not.

R. A. HARRISON
North Vancouver, British Columbia

Being a native Texan and living on the flat plains, I sorely missed seeing in your story a more impressive view of Lake Louise (pages 64-5), one of the most beautiful spots on earth.

WILLIAM LEO CAPDEVIELLE
Houston, Texas

Born and raised in Alberta, I do not believe you have accurately portrayed one of Canada's most beautiful and unpopulated natural areas. In my 35 years of visiting Banff, I have yet to see a brown haze of exhaust fumes. There is also little or no litter along the highway. You can still walk a trail and not encounter any sign of man. How many places can boast of that in this day and age?

KIM TUFF
Bragg Creek, Alberta

It is scary to read comments about putting more restaurants and chalets on the mountains and doubling the width of the highway. Sounds like typical short-term business and political goals. The traffic in the park should be reduced, not increased. Fortunately there are concerned residents in Banff. Recently they have been pushing for a bylaw to reduce the diesel fumes from buses. It may get better.

JACQUES RAYMOND
Calgary, Alberta

Heart of the Rockies Map

After nearly 70 years of reading your wonderful magazine, it's hard to know what I have liked best. Recently my own happy memories of trail rides through the northern Rockies rushed to mind when I saw the July supplement. Alas, I found an error. In September 1994 the U. S. Board on Geographic Names approved the renaming of Elk Mountain, north of Santa Fe, as Mount Barker in honor of Squire Leander Barker and his family, who for the past hundred years have played a prominent role in northern New Mexico.

WILEY F. BARKER
Los Angeles, California

The newly named Mount Barker is, in fact, a different mountain; it lies about a mile south of Elk Mountain.

Thank you for including Benchland. The state of Montana removed it from highway maps, but we still have highway signs. Although the town has a population of eight, it serves a large area with its thriving farmers' cooperative, community hall, and women's club. I say I'm from Benchland, although we live one and a half miles away.

But you missed an entire highway between Harlowton and Big Timber!

PATRICIA M. HODGE
Moccasin, Montana

The digital satellite maps of the Middle East in June were exquisite, but the Rockies supplement in July

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For vertical compositions, the Elan IIE is equally proficient. Bi-directional Eye-Controlled Focus allows for more versatility by putting three-point autofocus between you and your subject no matter which way you orient the camera.

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The Elan IIE is equipped with an advanced, built-in flash. And Canon's exclusive E-TTL flash system, available with the optional Speedlite 380EX, helps to provide a natural balance between subject and background.

Sshhh, The Zebras Are Feeding

Elan IIE's improved Whisper Drive allows you to rewind film in near silence. Whether you're shooting on the Serengeti or on the sly in your own backyard, there are a number of situations which demand quiet performance — and Canon delivers!

Hey, Cool Looking Camera!

Thanks. And, with an improved control layout, it's even easier to use. Form and function are truly united in the Elan IIE.

Canon

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left me breathless. Every butte and plateau of our area is discernible. I can clearly see what some geologists refer to as the old Green River channel, from the time when, they hypothesize, the river flowed eastward rather than south through the Uintas as it does today. This rendering alone is well worth the entire year's membership fee.

CAROL ALDINGER
Green River, Wyoming

Kobe Earthquake

Gaman is a quality we should learn from the Japanese. It is a sad fact that the world, particularly Americans, was amazed at how calm and collected the people remained after the Kobe earthquake and how little looting took place. Many non-Japanese consider such behavior unemotional and unfeeling. But "inner strength" is a national characteristic here to be admired and mimicked. I should know. I lived through the quake and witnessed gaman with my own eyes.

JONO FELDMAN
Osaka, Japan

Earth Almanac

I am a teenager who loves animals, and I was saddened by the report about eight bull elephants missing from Kenya's Amboseli National Park. My father, who grew up in Kenya, used to tell me about the abundance of wildlife he saw there every day. I want to know if any of the bulls, besides those whose carcasses were discovered in Tanzania, have been found?

MONIKA VERMA
Los Angeles, California

Cynthia Moss tells us that two of the missing bulls have reappeared. The Tanzanian government has now banned tourists from hunting elephants along the Kenya border near Amboseli. The ban will continue at least until the end of the safari hunting season in March 1996 while the two nations try to agree on how best to manage tourist hunting. They may create a buffer zone on the border. Tanzania's elephant population has shrunk from 250,000 in the early 1980s to 60,000 today. Sixty-eight have been killed since 1990 by tourist hunters, although the nation's yearly quota under the Convention on International Trade in Endangered Species is 200.

Behind the Scenes

Your May 1966 "Bridges of Madison County" cover was not only make-believe but also anachronistic (July 1995). The line at the bottom of that cover that begins "Official Journal of . . ." first appeared on the November 1967 cover. Prior to that, the line began "The Journal of. . . ."

RONALD D. TRIGUEIRO
Carruthers, California

Letters for FORUM *should be sent to National Geographic Magazine, Box 37448, Washington, D. C. 20013-7448, or by fax to 202-828-5460. Include full name, address, and daytime telephone. Letters selected may be edited for clarity and space.*

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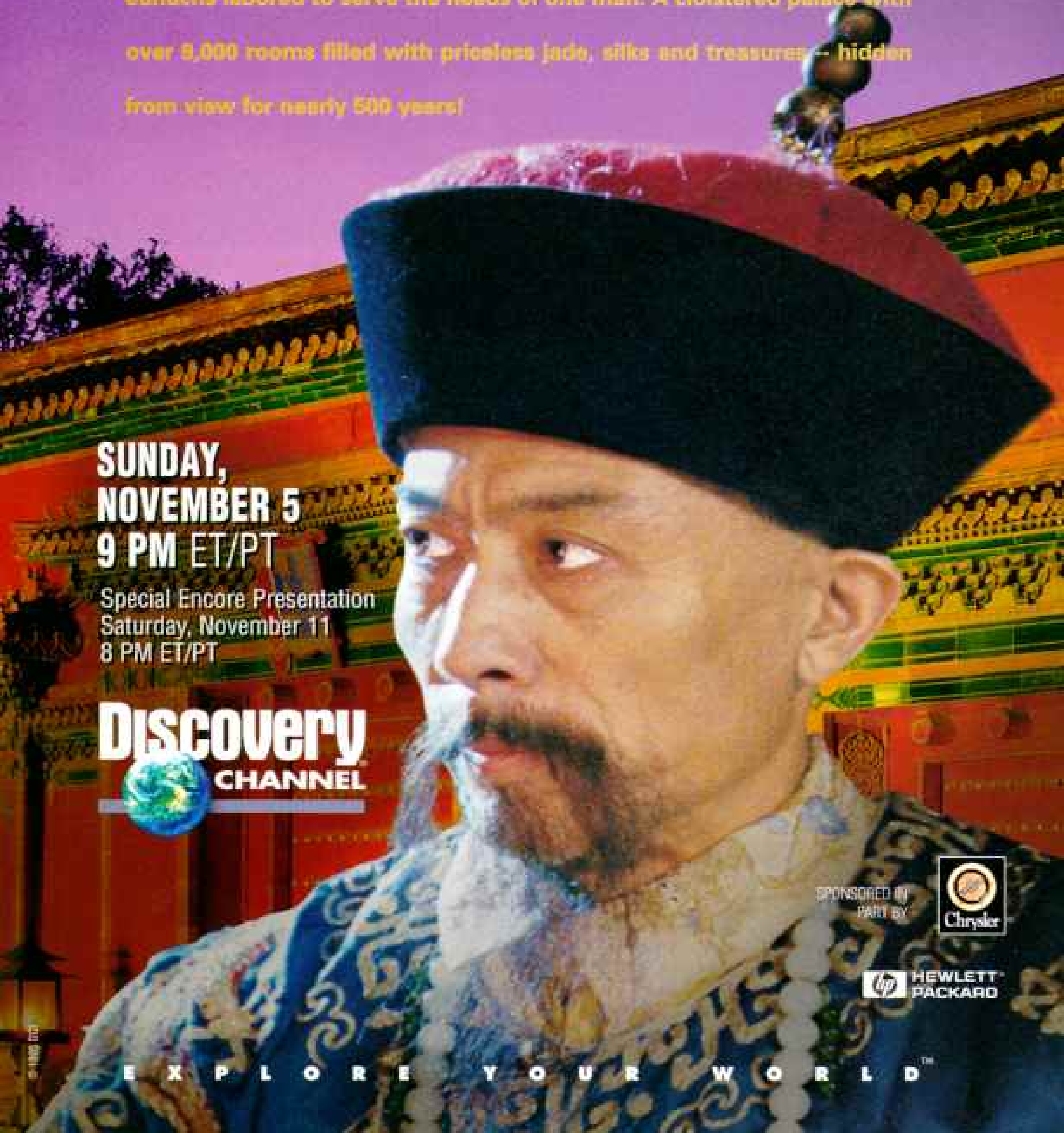

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Geographica

DARWIN D. BEARLEY ANTIQUES, AKRON, OHIO

MUSEUM OF AMERICAN FOLK ART, NEW YORK CITY

Amish Quilts: The Key Is Geography

TO MOST OUTSIDERS the ways of the Amish seem uniform no matter where the Plain People live. But a recent study of their colorful quilts, a cultural mainstay since the mid-19th century, shows differences between the Amish of Pennsylvania and those of Ohio.

Quilts sewed by the Amish in Lancaster County, Pennsylvania, like this unsigned Diamond in the Square (above, right), were made of large squares of material with a center design and wide borders.

Amish families who migrated to Holmes County, Ohio, settled along a major road west, befriended their "English" neighbors, and adopted different quilt patterns. Often making do with scraps of fabric, the Ohio quilters pieced together multicolored rectangles in repeated patterns like Roman Stripe (above, left), a group effort signed with initials and presented as a gift.

Examining quilts in both states, geographer and quilter Karen M. Tritonoff of Bloomsburg University in Pennsylvania found that "within each community the same pattern has been made with little change for years."

Cooking Up a Stew of Ancient Dishes

TAKE A LING FISH and wash its stomach, which Shetland Islanders call a muggie. Tie one end, fill with oatmeal and sliced cod liver, tie the other end, and boil in salted water for 30 minutes. You've prepared a dish Britons have feasted on for thousands of years: hakka muggie.

Jane Renfrew, a University of Cambridge paleoethnobotanist, combed historical records and archaeological reports on "the refuse of everyday life: seeds, animal bones, burnt tissue" to compile such recipes for *A Taste of History: 10,000 Years of Food in Britain.* Among her culinary delights: slott, a cod-roe dumpling; boiled samphire, a plant growing in salt marshes; and blaanda bread, an unleavened oatmeal-and-barley staple resembling a flat scone.

RICHARD THOMPSON

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Fixing a Monument to a Local Hero

WHEN THE ESTEEMED C. Julius Zoilos died about 20 B.C., the citizens of Aphrodisias, a Roman Empire sculpture center, built a marble mausoleum. In the 1950s farmers in western Turkey uncovered pieces of the mausoleum's frieze bearing six-foot-high allegorical figures. They captivated New York

CHRISTOPHER BATTÉ, NEW YORK UNIVERSITY

University archaeologist Kenan Erim, who worked at Aphrodisias until his death in 1990 (GEOGRAPHIC, August 1967, June 1972, and October 1981).

Erim guessed at the alignment of the pieces when they were placed in the Aphrodisias Museum. Recently, art historian R.R.R. Smith found faint inch-high guide letters at the slab edges and rearranged the scene (above, from left): Bravery presents a shield to Zoilos, who is crowned by Honor; the People greet Zoilos, then the City also crowns him.

"Telemedicine" Offers Long-Range Diagnosis

RADIOLOGIST Konrad Kirlew checks an X ray at University Center Imaging in Melbourne, Florida (right). Within hours, another specialist will offer a second opinion—from 2,300 miles away in Los Angeles.

Using the information superhighway, the "telemedicine" system links the Florida clinic with radiologists at the UCLA Medical Center. Specialists there receive digital images of MRI, CT, and nuclear scans via fiber-optic telephone lines. Transmission of each scan takes about ten seconds, and doctors usually report back within 24 hours.

"With this process, we can 'move' the best medical talent to our patient's bedside instead of forcing the patient to get on a plane and go to the specialist," says Dr. David Gibson, whose firm launched the Florida center last March.

HANS BÄNZIGER

Tear-Drinking Moth: Nothing to Cry About

SMALL ANNOYANCE to a big animal, a moth pokes its proboscis into the eye of an Asian elephant and irritates it. "The eye secretes fluid; then the moth sucks the fluid," says Hiroshi Inoue, who identified *Hypochrosis baenzigeri* in 1982.

This little flier seeks moisture and salts, as do a hundred other moth species that feed on the eye fluids of mammals, including—occasionally—humans.

Inoue named the Asian insect for Hans Bänziger of Thailand's Chiang Mai University, the authority on tear-drinking moths. Bänziger reported that after one moth clung to his eyelid, sucking his tears for two minutes, "I could bear it no longer and caught the tormentor."

—BORIS WEINTRAUB

BRIAN SMITH

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In addition, you'll feel safe knowing that for 44 years, as it has trekked the globe, the Land Cruiser has continued to evolve. Because while you can never really own nature, you can have a controlling interest.

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Before You Take Advil or Tylenol Again, Get a Second Opinion

It's been about a year since a pain reliever called Aleve® was made available to consumers without a prescription, and its benefits are being discovered by more and more people each day.

In fact, clinical studies show that Aleve has key advantages over other brands. At the end of the day, a two-pill dose of Aleve provides stronger pain relief than a dose of Advil®.* It provides longer-lasting relief than Extra Strength Tylenol® and is gentler on the stomach lining than aspirin. So if you haven't been satisfied with your current pain reliever, you may want to try Aleve.

Aleve is the only non-prescription pain relief product that offers Americans in pain a completely different active ingredient — naproxen sodium†. It was developed from Naprosyn® (naproxen) and Anaprox® (naproxen sodium), two of the world's most widely used prescription pain relievers. That's probably why so many doctors have already recommended Aleve for their patients.

Here are some additional things you may want to think about when considering this new choice:

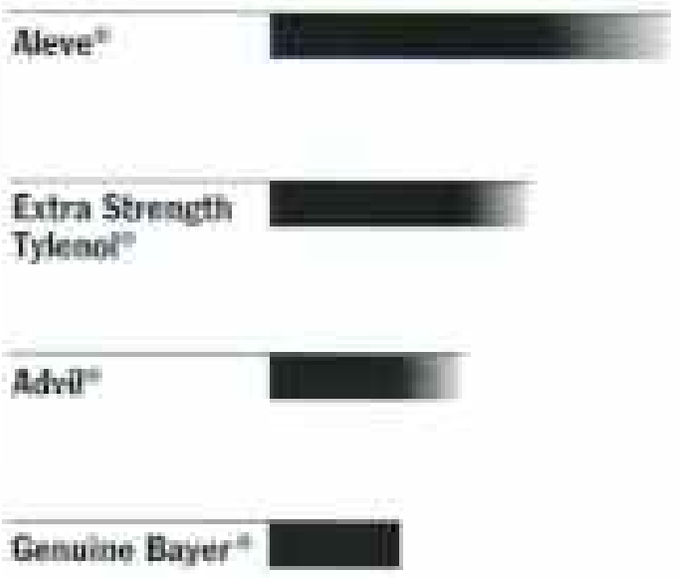
THE DOSING ADVANTAGE

Most pain relievers are labeled to be taken up to four or six times a day, which may not be convenient if you want to work all day or sleep through the night. However, in looking at the recommended dosing chart (above right), you will notice a basic difference with Aleve. Aleve is labeled to be dosed every 8 to 12 hours instead of every 6 to 8 hours like Extra Strength Tylenol, or 4 to 6 hours like Advil.

*Based on a single, 2-pill dose pain relief comparison at 11 and 12 hours.

†Do not take this product if you had either hives or a severe allergic reaction after taking any pain reliever.

RECOMMENDED DOSING



THE VALUE DIFFERENCE

How often you have to take a pain reliever also affects your wallet.

These days, it's important to get the most for your money. The table below shows that the price on the bottle is not the best guide to value. The cost for the number of pills you have to take for the maximum daily dose varies greatly. The cost for Aleve shows it may be an excellent choice for value-conscious consumers.

THE SAFETY STORY

Finally, even though you can buy them almost everywhere, remember OTC pain relievers are serious medicine. It's important to read the product's label and directions carefully.

COST PER 24 HOURS OF PAIN RELIEF
(Based on Maximum Daily Dose)

BRAND	COST
Aleve (3 pills)	$0.31
Advil (6 pills)	$0.63
Extra Strength Tylenol (8 pills)	$0.78
Genuine Bayer (12 pills)	$0.94

Based on IRI drug outlet pricing data on 50 count bottles (1/1/95–4/2/95).

You may have recently heard of reports in leading medical journals, such as the Journal of the American Medical Association, linking acetaminophen (the active ingredient in Tylenol) to possible liver damage. These patients took more than the maximum daily dose of acetaminophen, and many of these patients were either fasting and/or consuming alcohol. If you consume three or more alcohol-containing drinks per day, you should ask your doctor for advice for when and how you should take any OTC pain reliever. In fact, it was recently announced that all OTC pain relievers should have an alcohol warning.

Look for a list of the approved uses for the product, how often and for how long you can take it, and especially for any warnings or side effects of which you should be aware. For example, if you suffer from stomach pain, you should check with your doctor or pharmacist before taking aspirin, ibuprofen or naproxen sodium. Remember, when used properly, OTC pain relievers can provide safe and effective relief from most common aches and pains.

THE BOTTOM LINE

For the first time in more than 10 years, there's a pain relief choice that's really different — Aleve. And having a new choice means that you are better able to find pain relief that's right for you.

If you are in doubt about what to take, ask your doctor or pharmacist. Chances are, he or she may recommend Aleve. Even though it's been around for only one year, many doctors have already recommended it.

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Ring-tailed Lemur *(Lemur catta)* **Size:** Head and body length, 42.5 cm; tail, 60 cm **Weight:** 3 – 3.5 kg **Habitat:** Deciduous and gallery forests and dry scrub in south Madagascar **Surviving number:** Unknown
Photographed by Frans Lanting

WILDLIFE AS CANON SEES IT

A ring-tailed lemur positions itself to take in the warming rays of the sun. Groups of these lemurs spend the day feeding and resting in the trees and on the ground. To protect their young, adults have alarm calls that distinguish between terrestrial and avian predators. Though often seen in captivity, and abundant in some parts of Madagascar, the ring-tailed lemur is now threatened by habitat loss. To save endangered species, it is vital to protect their habitats and understand the role of each species within the earth's ecosystems. As a global corporation committed to social and environmental concerns, we hope to foster a greater awareness of our common obligation to ensure that the earth's life-sustaining ecology survives intact for future generations.

NATIONAL GEOGRAPHIC

On Television

■ SPECIAL, WEDNESDAY, NOVEMBER 29

Head for the Cellar: Big Storms Coming

"THE COW that flew past me, she was screaming," recalls Brook Ibarra, who was swept up in a tornado like this one blasting across Kansas farmland. The new National Geographic Special "Cyclone!" explores whirlwinds—from harmless dust devils to earth's most powerful storms. These swirling gyres include deadly tornadoes that blow as hard as 280 miles per hour as well as hurricanes and typhoons, which batter coasts with violent winds and destructive storm surges. Says film producer Teri Koenig: "All we can do about such weather is prepare for the worst."

SHEILA REDIGHER, GAMMA LIAISON

■ PROGRAM GUIDE

National Geographic Specials
NBC, Wednesday, November 29
"Cyclone!" See local listings.

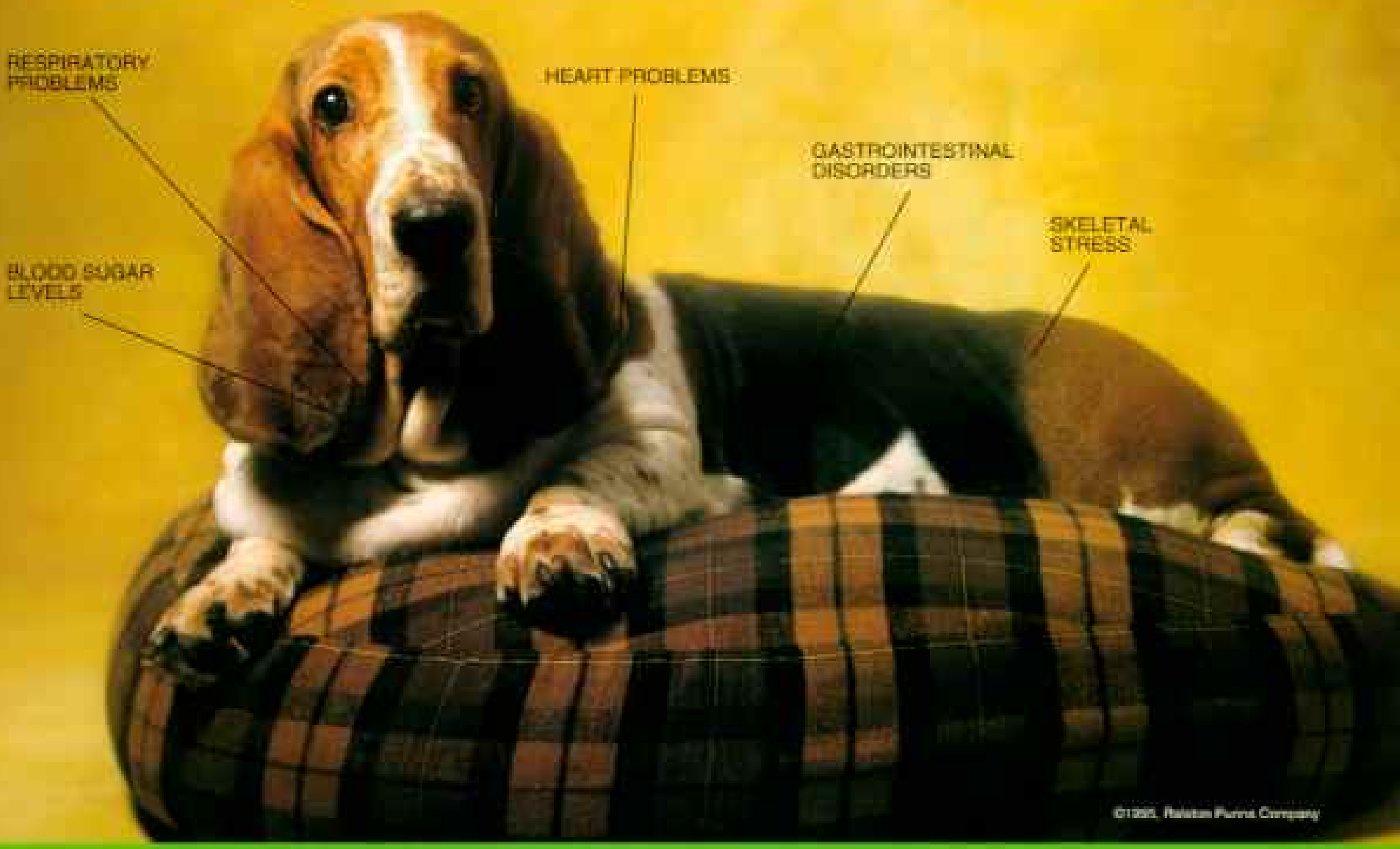
National Geographic EXPLORER
TBS: Sunday, 9 p.m. ET
November 12: "Deep-Sea Detective: The Ballard Expeditions"
November 19: "Sunset, Boulevard of Dreams"; "Wave Warriors"

Children's Programming
CBS. Saturdays, 12:30 p.m. ET
"Really Wild Animals"

National Geographic Videos and Kids Videos
Call 1-800-343-6610.

Heavy Isn't Healthy.

Excess weight can be associated with certain health conditions



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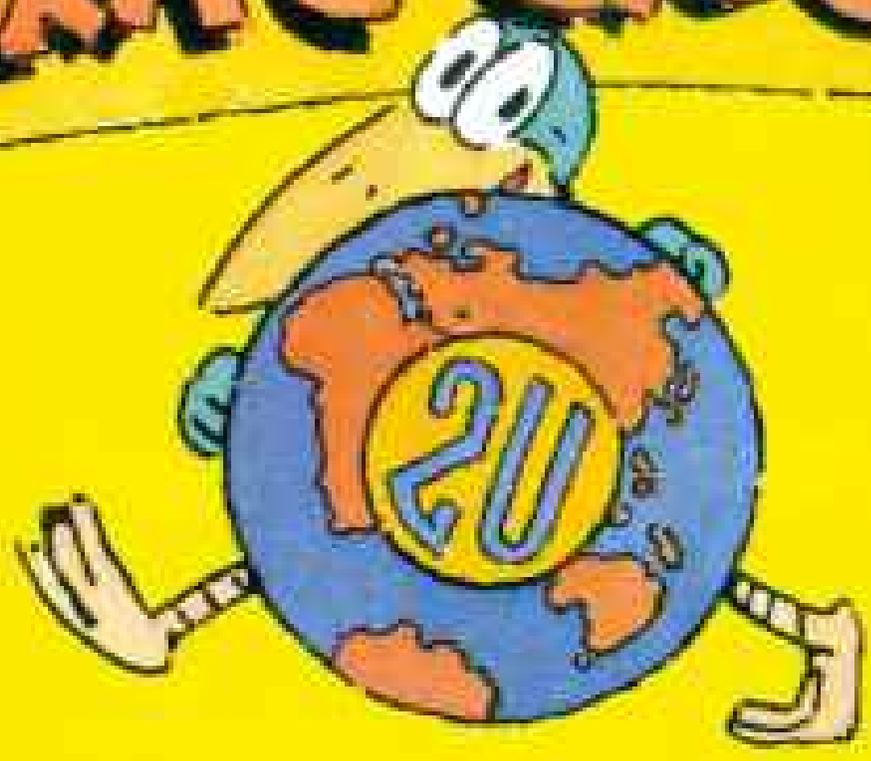
Monitor your dog's weight by regularly giving him the Purina® Fit & Trim® Rib Check.™ Put your thumbs on his backbone and both hands on his rib cage. If you can't easily feel his ribs, your dog probably needs to shed a few pounds.

And remember, for the health of your dog, please visit your veterinarian regularly.

Purina® Fit & Trim: What Every Dog Should Be.

Calling all families...

EARTH 2U, EXPLORING GEOGRAPHY



A new interactive geography exhibit for children ages 8–12 (adults will love it too)!

Opening Nov. 15 at

NATIONAL GEOGRAPHIC

1145 17th Street N.W., Washington, D.C.

Pull the levers, poke the buttons, and follow the clever little mascot to explore the exciting world of geography! It's fun, it's free, and it's educational! Member families visiting Washington are invited to enjoy this exciting new exhibit on display at the Society's Explorers Hall museum from November 15 – February 11.

Earth 2U, Exploring Geography has been organized by the Smithsonian Institution Traveling Exhibition Service and the National Geographic Society. The exhibition and educational programs are made possible through the generous support of Nissan Motor Corporation U.S.A.

This exhibit will travel to 40 cities over the next five years. For further information, call 1-800-NGS-LINE.

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NATIONAL GEOGRAPHIC

EarthAlmanac

MICHAEL NICHOLS

Epitaph for Two Mountain Gorillas

SHOT THROUGH THE HEART, a silverback called Rugabo will no longer delight visitors like these in Zaire's Virunga National Park. Guides found Rugabo and an adult female, who died the same way, August 14, after our October article on this threatened species was on press.

A week later a three-year-old gorilla from Rugabo's group of 24 was found wandering alone and was reunited with the others. Poachers probably killed the adults to kidnap and sell the youngster, who may have escaped, says Popol Verhoestraete of the International Gorilla Conservation Program in Zaire.

Out of perhaps 600 mountain gorillas in central Africa, six have been killed by poachers this year. Rugabo's group had been tracked daily by guides for ten years and had attracted tourists to bolster Zaire's economy. But with thousands of refugees from Rwanda flooding the area, the misfortunes of war may have brutally intervened.

Good Bugs Die With Gypsy Moths

MENACING EVEN UP CLOSE, gypsy moth caterpillars have plagued U. S. forests since 1869, when the moths were accidentally introduced from Europe. One pesticide, called Dimilin, is now widely used. But Dimilin also kills butterflies and other harmless insects, according to entomologist Linda Butler. Such claims are "overblown," says Laureen Treu of Uniroyal Chemical Company, Inc., Dimilin's manufacturer. Meanwhile, a fungus from Japan is decimating gypsy moths and may prove kinder to noncombatants in the gypsy moth war.

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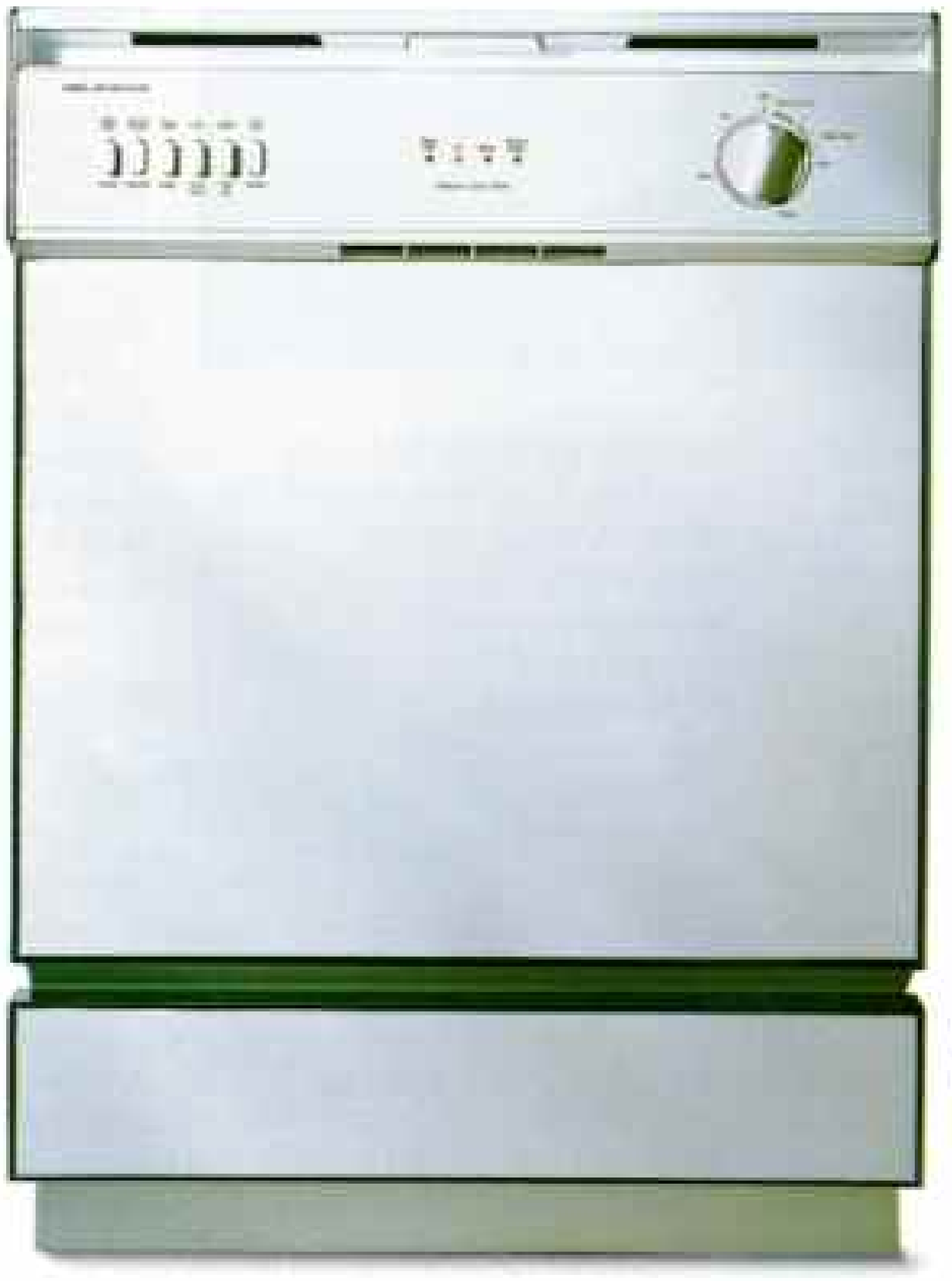

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HOWARD HALL; PAINTING BY WILLIAM W. BOND (BELOW)

Huge, Gentle Basking Sharks Are Vanishing

SECOND LARGEST FISH, after the whale shark, a basking shark strains California waters for plankton. These gentle giants, which can reach 40 feet, seem to be disappearing from many oceans. In 1991 roughly 300 basked in Monterey Bay. "Early this year we found only one," says Sean Van Sommeran of the Pelagic Shark Research Foundation; similar decreases have been reported off Europe and Asia.

Noting that seasonal or climatic changes may be at work, Van Sommeran also points to hunting. More than a dozen dead sharks with their fins cut off have been reported—"They go for $200 a pound in the shark-fin-soup trade."

How Did Insects First Take Wing?

INSECTS BECAME AIRBORNE some 350 million years ago, but their wings didn't evolve suddenly. Was there a transition species that had wings but couldn't fly? Yes, says Penn State biologist Jim Marden, shining his spotlight on the primitive stone fly, its wings (below, at right) suggested by fossil evidence. Today's stone fly, at left, hatches in streams and bears its wings to skim to shore, he says. But tossed into the air, it falls, unable to fly. By supporting their weight on water, other insects could have gradually mastered the aerodynamics of the wing.

Wildlife Flocks to Cranberry Farms

THERE'S NOTHING LIKE A BOG to gladden the hearts of bluegills, herons, turtles, and frogs. In Massachusetts the cranberry is the commercial bog king. Cranberry bogs are naturally wildlife friendly, and some growers make them even more so. Last year in South Carver, Gary Garretson, general manager of Slocum-Gibbs cranberry farm—seen during fall harvest—won a green-minded business award from the Wildlife Habitat Council.

Garretson had built nesting boxes for bluebirds and kestrels and erected an osprey tower, where three chicks have hatched. His cranberries grow on 53 parcels. "Our habitats are really diverse, and so is our wildlife," he says. —JOHN L. ELIOT

WENDY MAEDA, BOSTON GLOBE

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NATIONAL GEOGRAPHIC

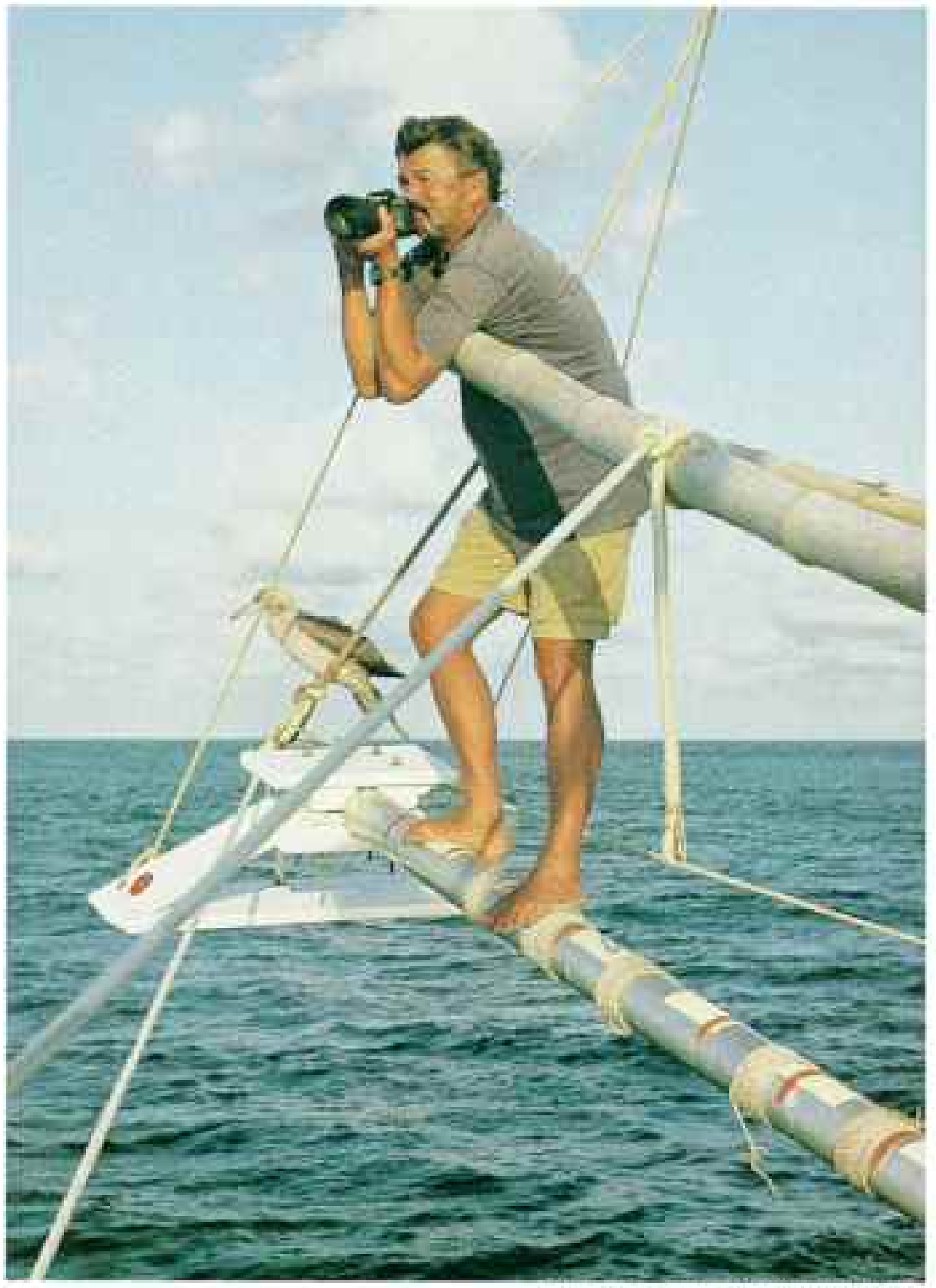
On Assignment

■ SPERM WHALES

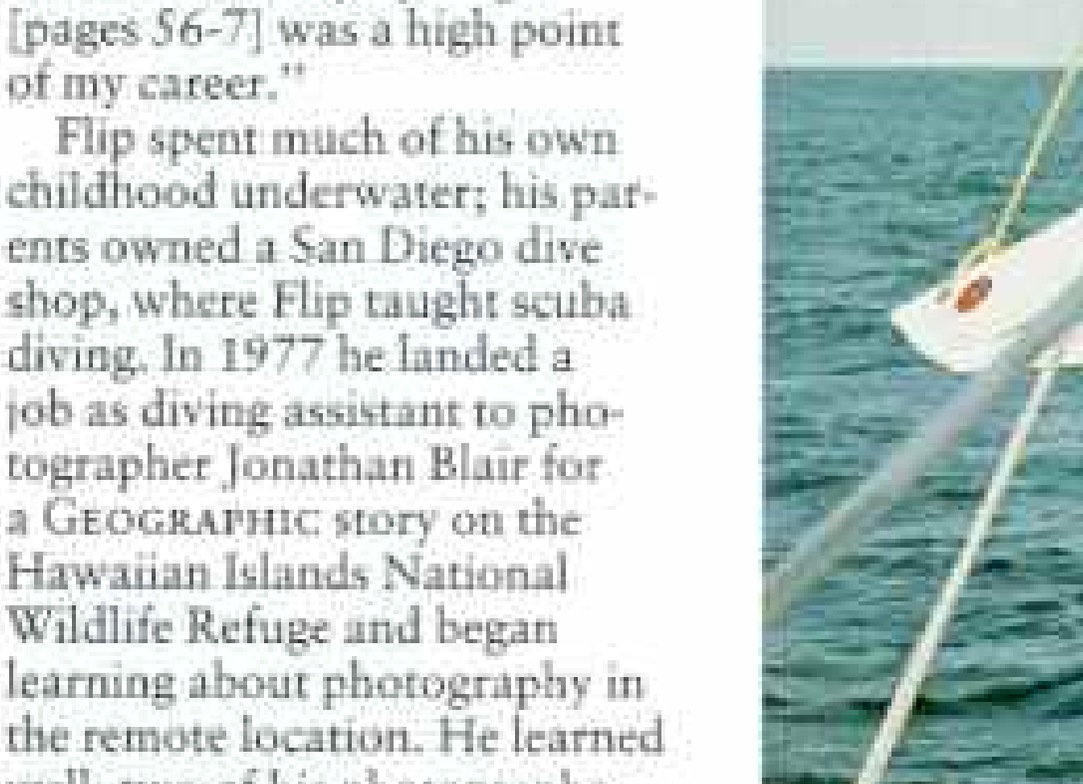
On the Lookout for Baby Moby

"It was like finding Moby Dick," says FLIP NICKLIN, a freelance photographer who specializes in marine mammals, here scanning for sperm whales with a feathered friend 300 miles off Costa Rica. Spotting a white sperm whale is very rare—the holy grail of whale-watching. On the last morning of his fieldwork in the Azores, Flip heard that an adult white was in the vicinity. "I dived," he says, "and there was a baby white sperm whale, looking right at me from behind an adult. Photographing it [pages 56-7] was a high point of my career."

Flip spent much of his own childhood underwater; his parents owned a San Diego dive shop, where Flip taught scuba diving. In 1977 he landed a job as diving assistant to photographer Jonathan Blair for a GEOGRAPHIC story on the Hawaiian Islands National Wildlife Refuge and began learning about photography in the remote location. He learned well; two of his photographs appeared in the May 1978 article, and Flip was hooked.



KIT HOUSER, WHALE CONSERVATION INSTITUTE



MARIA STENZEL

■ SQUIRRELS

Working in Her Own Backyard

"You don't have to leave home to find adventure," insists writer DIANE ACKERMAN, who didn't have to leave her home in upstate New York to find a story, either. Three years ago she began observing squirrels in her own yard, putting out corn and nuts for the inquisitive creatures she thinks of as "neighbors."

This is Diane's second article for the GEOGRAPHIC. The first, on Hawaiian monk seals, provided the inspiration for her new children's book, *Monk Seal Hideaway* (Crown, 1995).

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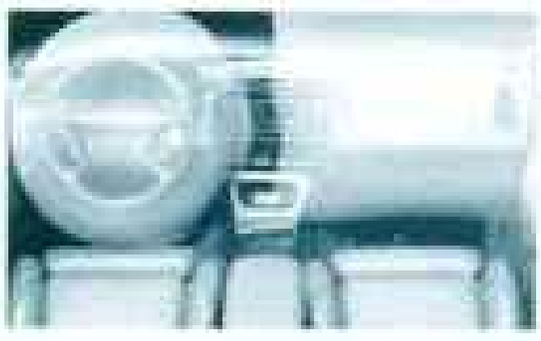

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