

NATIONAL BESTSELLER

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TARAS GRESCOE

bottomfeeder



HOW TO EAT ETHICALLY IN
A WORLD OF VANISHING SEAFOOD

Bottomfeeder

How to Eat Ethically in a World of Vanishing Seafood

Taras Grescoe

 HarperCollins e-books

DEDICATION

To Erin

Table of Contents

[Cover Page](#)

[Title Page](#)

[Dedication](#)

[Introduction](#)

[One the Rise of the Goblin](#)

[Two in the Kingdom of the Oysters](#)

[Three Panic at the Chippy](#)

[Four Small Pond](#)

[Five Fish She is very small](#)

[Six Wave of Mutilation](#)

[Seven Buddha Jump Over the Wall](#)

[Eight Sorry, Charlie](#)

[Nine an Economy of Scales](#)

[Ten Fast Fish, Slow Fish](#)

[Conclusion](#)

[Appendix Tools for Choosing Seafood](#)

[Sources](#)

[Index](#)

[A Note on The Author](#)

[Acknowledgments](#)

[International Acclaim for Bottomfeeder](#)

[By the Same Author](#)

[Copyright](#)

[About the Publisher](#)

INTRODUCTION

FOR THOSE WHO like to believe some things will never change, it must be good to know that places like Hubbards still exist.

On the road west from Halifax, you know you are getting close when you see the sign for the Shore Club, “Nova Scotia’s Last Great Dance Hall,” which has been serving two-pound lobsters and fresh berry shortcake since the end of the Second World War. Along the side of the road, fishermen sell discount scallops and solomon gundy, the local version of pickled herring, from the back of beat-up vans. Between the seaside rocks and the tiers of pine trees, black-roofed bungalows face the waves, many of them lobstermen’s homes now turned into summer cottages for city dwellers.

St. Margarets Bay, on which Hubbards sits, is a notch cut into the granite barrens of Nova Scotia’s south shore, filled to the rim twice daily with a generous cupful of Atlantic. This morning, the bay is socked in with fog, but the sun is already punching holes through the scrim of gray, making the plastic buoys and wooden dories on the water appear to glow from within. Standing on the deck of the *Vicki & Laura*, Lorne Harnish turns the wheel of his thirty-two-foot lobster boat, circling hard toward a wooden buoy attached by a rope to a trap at the bottom of the bay.

Cutting the motor, Harnish grabs a long gaffing pole, hooks the rope out of the water with a quick twist of his wrists, and threads it over a hubcap-sized pulley; a hydraulic winch rapidly pulls the ninety-pound trap to the surface. A semicylinder of bent oak roofed with maple slats and walled by netting, the trap looks like a miniature Quonset hut. Inside, four brownish-green lobsters cling to its seaweed-covered mesh. Harnish detaches one with difficulty—it raises its claws in challenge, like a boxer facing a foe. After using a metal gauge to measure its carapace, he throws it into a plastic tub. The rest are shorts, too small to keep, and get tossed back into the water.

Though the lobsters are coming up undersized this late in the season, all in all it has been a good year for the lobster industry. Back in December, Harnish was catching half a tonne a day and selling them for \$7 a pound to the local lobster pound. At the Halifax airport duty-free, two-pound lobsters, conveniently boxed for carry-on, are selling for \$27.98.

By now the fog has burned away and St. Margarets, in all her ill-punctuated beauty, has revealed herself, the deep blue of the surface pixilated with thousands of fluorescent-hued buoys, each corresponding to a sunken lobster trap. All told, ten boats profitably work this tiny bay. For the last decade, from the Irish Sea to the Scotian Shelf, the lobstermen of the North Atlantic have been experiencing boom times. In the Gulf of Maine alone, southwest of Nova Scotia, there are thought to be three million traps in the water. When Lorne Harnish started fishing in the early 1970s, there were barely enough lobsters in the bay to keep him going for a week. Now he can haul up seven thousand pounds, in a season that lasts a full five months. Harnish, who has just turned fifty-seven, says he has no plans of retiring.

Harnish figures the lobster boom has something to do with “whore’s eggs,” local slang for sea urchins. Thirty-five years ago the bay was full of them. In the Gulf of Maine the urchins disappeared when they were harvested for their roe for the Japanese market; here, Harnish believes, they simply gnawed through the kelp, eating themselves out of house and home. Once the sea urchins were gone, the kelp returned, providing shelter and hunting grounds for the lobsters, who flourished in their turn.

Ecologists have another explanation for the boom. The shallow waters off Nova Scotia used to be full of swordfish and bluefin tuna, as well as untold numbers of hake, halibut, and haddock. Cod in particular were the apex predators in these parts. They prowled the gullies offshore in dense shoals,

using their powerful mouths to suck up free-swimming lobster larvae, sea urchins, and even full-grown crustaceans. But the cod were fished to collapse in the early 1990s. With the cod gone, stocks of lobsters and other low-in-the-food-chain species exploded. It is a story that has been repeated throughout the Atlantic: with top predators fished to a fraction of their former abundance, it has become an ocean increasingly populated by shrimp, lobster, crabs, and other resilient, fast-growing crustaceans. An ocean, in other words, of bottomfeeders.

Harnish's day continues: he gaffs a rope, hauls up and empties the trap, fills the wire bait box with rotten mackerel, drops the trap, then moves on to the next buoy, until all 130 traps have been cleared out and rebaited. For the cottagers relaxing on lawn chairs on the shore—perhaps looking up from a headline about another ice shelf collapsing in the Antarctic—the sight of the *Vicki & Laura* finishing her rounds must seem soothing. St. Margarets Bay looks timeless and unchangeable, and the fishing boats look busier than ever.

They are wrong. The Atlantic is an impoverished ocean, and Harnish is actually working a monoculture, one whose single crop is the American lobster. Around the world, more unappetizing creatures are proliferating in the absence of big fish. Carpets of primitive sea squirts now cover continental shelves, preventing other forms of life from growing. Flotillas of jellyfish, some ten square miles in area, are stinging farmed salmon in floating sea cages to death. The filter-feeding fish that once cleaned the oceans are being caught and ground into fertilizer, causing giant blooms of toxic plankton which poison long stretches of coastline. The lobster boom of the Atlantic, in other words, may just be a tiny blip on a slippery slope to oceans filled with jellyfish, bacteria, and slime.

If these are salad days for bottomfeeders, it is only because human beings are doing something unprecedented, and perhaps irrevocable, to the seas of the world. With great application—and faster than anybody thought possible—we are eating our way to the end of the food chain. Unless we change our attitude to seafood, the future of the oceans may look a lot like the present of St. Margarets Bay: once varied ecosystem, being reduced by human activity to a few weedlike, and increasingly inedible species.

The Case for Seafood

I love seafood. And by seafood, I mean fresh-caught sardines as well as raw salmon tartare; piles of just-peeled coldwater shrimp and trays of raw flat-shelled oysters; sesame-oil-drenched jellyfish salad and deep-fried haddock; in fact just about any squirmy, wriggly, fishy, edible thing that comes out of the ocean. I have some almost every day.

Let me explain. Ten years ago I cut meat and poultry out of my diet and limited my flesh-eating to fish. I had read too many news items about growth hormones, factory farms, and antibiotics to feel good about a regular diet of steaks, burgers, and chicken; the alternative, organic meat, was expensive and at the time hard to find. (In the years that followed, as the mad cow scandal broke and it became advisable to treat salmonellosis-laden raw chicken in your kitchen as if it were a biotoxin, it was a decision I had no cause to regret.) Seafood seemed like a logical choice: fish not only had half the fat of beef but also seemed to be in endless supply. The oceans were immense and apparently inexhaustible. True, the cod fishery off Newfoundland had recently collapsed, but that, I figured, was fluke that could be blamed on bad science, greed, and inept bureaucrats. The supermarket shelves were still piled high with canned tuna, the fast-food joints were selling bargain all-you-can-eat shrimp, and a fillet of Atlantic salmon was cheaper than it had ever been. There were lots more fish in the sea.

There would *always* be lots more fish in the sea.

I quickly began to discover the advantages of being a piscivore, a fish eater. A seafood meal, after all, is one of life's great simple pleasures. Find a pier, a creek, or a fishing hole, dangle a hook and line into the water, and with a bit of luck (as well as a fire, some foil, and a wedge of lemon), you've got dinner. Centuries after agricultural societies replaced game and fowl with domesticated livestock and venison and partridge became rarities reserved for the tables of the rich, there are still hunter-gatherers going to sea—fishermen*—who bring back a form of game that people of all classes can afford to eat. In most supermarkets, fish is the only real wild food, a product not created by industrial agriculture, that you are likely to find.

And human beings will eat just about any kind of seafood, no matter how daunting. South Americans enjoy the *picoroco*, a huge edible barnacle with a Krakatoa-shaped shell that conceals a golf-ball-sized sphere of glistening white flesh, as sweet as crabmeat. The French have figured out a way to turn the reproductive organs of the cuttlefish, *la pousse de la seiche*, into a delicacy, and the Japanese long ago mastered the art of making the poisonous pufferfish into sashimi. More astonishing to me is the fact that anybody eats the hagfish, a lampreylike bottom-dweller that haunts abysses two miles beneath the surface. Lacking a spine, a gas bladder, or even a jaw, it employs a rasping tongue to burrow into its prey. Marine biologists who find whale corpses on the ocean bottom often observe that the flesh of the dead giants is actually crawling—a grisly submarine puppet show courtesy of the thousands of hagfish writhing through the rotten meat. Threatened by a shark, the hagfish will excrete mucins from dozens of pores, choking its attacker's gills with gallons of rapidly expanding slime. (It then sloughs off the mucus by tying itself into a bow and squirming the knot down its body.) The hagfish gets my vote as the most repellent fish in the sea. Yet Koreans consider it a delicacy: they import nine million pounds a year and savor it as an appetizer after broiling it in sesame oil.

Entire cultures have built elaborate identities around the cooking and consumption of seafood. In a world of homogenized fast food and microwavable frozen dinners, seafood cultures serve as bastions of local tradition. To be Venetian is to have grown up with the taste of *spaghetti alle vongole veraci* (though the Lagoon's native bivalves have succumbed to pollution and must now be replaced with Manila clams). To be Japanese is to know the rituals of the sushi bar, the taste of seaweed-wrapped salmon roe, and the fact that the finest cut of the finest tuna you can order is called *o-toro* (though bluefin is now in such short supply that Tokyo's sushi bar owners are substituting other red-fleshed meat, such as smoked venison and horse). And to have lived on the shores of Chesapeake Bay is to fetishize deep-fried clam strips, the taste of breaded and battered oysters, and all the pleasures of a shoreline-kitsch-drenched seafood shack (even if the crab in the cakes you are eating happen to be Asian swimming crabs, flash-frozen in Indonesia and shipped to Washington, D.C.).

Fish have shaped human history. From medieval times the vast shoals of herring that annually poured down from Scandinavia forged Dutch and English seapower and created the wealth of the Hanseatic League and thus the balance of power that drew the map of Europe. Fish are responsible for humanity's spread across the globe: the technology for curing cod allowed men to undertake long sea voyages, permitted the Vikings to raid England and France and settle Iceland, and brought the Basque whalers to the Grand Banks.

And there is increasing evidence that, were it not for seafood, we would not be human at all. Life began in the sea, about four billion years ago, and the ancestors of all mammals were fish that crawled out of the oceans and colonized the land 360 million years ago. Because the remains of the earliest humans were found in what is now African savannah, anthropologists have long believed that man's ancestors left the forests for the open plains, in the process evolving the upright gait that led to bipedal

humans. But recent research on pollen records has shown that four million years ago such regions were not Serengeti-like plains at all but heavily wooded shorefront environment. Protohumans such as Lucy, like most of her kin, evolved close to the water.

These seaside roots may explain why our brains weigh twice as much as those of our closest earthen human relative, *Homo habilis*. Around two million years ago the hominid cranium started to expand, with an exponential growth spurt occurring about one hundred thousand years ago. Evidence from shell middens around early human settlements shows that this is exactly the time people started eating seafood in great quantities. Brain size is limited by the availability of docosahexaenoic acid (DHA, one of the fatty acids found in omega-3 supplements), without which it is impossible for the body to build brain cell membranes. The only place this acid is abundant in the food chain is in fish from the world's oceans, lakes, and rivers. It is likely our seafood-rich diet provided the nutrients that make us the world's brainiest primate. Without fish, we might still be microcephalic apes, swinging through the trees.

For generations, mothers have known that fish is brain food. It turns out that forcing children to choke down cod liver oil—or its modern equivalent, a capsule of omega-3 fatty acids—is a very good idea indeed. The human brain is 60 percent fat, and the kinds of fat you eat determine what your brain cells are made of. At the beginning of the twentieth century, much of the protein in the Western diet came from nest-laid eggs, beef and milk from grass-fed cows, and other free-range animals, all of which have higher levels of omega-3s than their industrially farmed counterparts. Starting about 1960, an unplanned study in brain chemistry has been taking place, one whose subject is the entire population of North America and much of Europe. Around that time corn and soybean oils and grain-fed livestock, all of which are relatively low in omega-3s but high in the structurally similar omega-6s, became the dominant sources of fat in our diets. Both forms of omega fatty acids are essential for making cell membranes more liquid, but people who have high levels of omega-3s—sometimes called the happy acids—are less prone to depression, dementia, and Alzheimer's disease. Thanks to half a century of consuming cheap vegetable oils, the average cell membrane of an American is now only 2 percent omega-3-based fats. In cultures where fish is still a staple, such as Japan, the average cell membrane is 40 percent omega-3 based.

The results of this experiment may already be in. In 1998 a paper in the British medical journal the *Lancet* showed that major depression spiked in New Zealand, Germany, the United States, and other countries with lower rates of fish consumption, but declined in such seafood-loving cultures as Japan, Taiwan, and Korea. In Europe suicide is highest in such landlocked countries as Austria and Hungary (where per capita consumption of fish is, respectively, 25 pounds and 10 pounds a year) and lowest among seafood-eating Portuguese (125 pounds) and Norwegians (114 pounds). A researcher with the American National Institutes of Health has shown that a mother's consumption of omega-3s during pregnancy can predict her child's intelligence and fine motor skills. The children of women who had consumed the smallest amount of omega-3s, the study found, had verbal IQs six points lower than the average. Telltale signs of a lack of omega-3s include dry skin and dandruff, life-less hair, brittle nails, and raised bumps on the skin. Perhaps most surprisingly, a lack of omega-3s seems to predict antisocial behavior: a daily dose of fish oils given to inmates in an English young offenders' prison reduced recidivism by 30 percent.

Nature's richest source of omega-3 fatty acids, which are ultimately derived from oceanic plankton, is wild-caught seafood. River fish such as trout have much lower levels, as do farmed fish, which are now often plumped up with vegetable oils. Though flaxseed oil is also a source of omega-3s, the human body is inefficient at converting it into DHA and eicosapentaenoic acid (EPA), the latter

of which is essential for cardiovascular health. Most national public health authorities now recommend having at least two meals of fish, especially such fatty species as mackerels and sardines a week.

“There are no limits to Jeeves’s brain power,” Bertie Wooster once marveled about his fictional gentleman’s gentleman. Author P. G. Wodehouse repeatedly had the clueless Wooster attributing his manservant’s intelligence to his seafood-heavy diet: “He virtually lives on fish. If I had even half his brains, I would take a shot at being prime minister.”

The evidence may be circumstantial, but I concur: if getting more omega-3s in my diet means lowering my risks of major depression, dementia, Alzheimer’s, suicide, and ending up in prison, then eating fish is a no-brainer.

The Case Against Seafood

Just as it is becoming clear that opting for fish may be the smartest dietary choice you could ever make, newspapers seem to be full of stories about how some kinds of seafood can be very bad for you indeed.

The flesh of some common fish, we now know, can be extremely toxic. In 2004 the influential journal *Science* reported that salmon contains dangerously high levels of carcinogenic dioxins and polychlorinated biphenyls, and it recommended eating no more than six meals of farmed salmon a year. Mercury, a heavy metal that can interfere with brain development—and, in cases of severe poisoning, causes tremors, dementia, hallucination, and death—was found to be so prevalent in fish that in 2007 the Royal Swedish Academy of Sciences recommended that a worldwide health advisory be issued. And a *National Geographic* exposé showed that two meals of large long-lived fish such as swordfish, halibut, shark, and tuna in less than twenty-four hours could more than double the amount of mercury in an adult’s blood.

In spite of these risks, fish and seafood are inspected much less rigorously than even the cheaper sides of beef. There is no Food and Drug Administration, British Food Standards Agency, or Canadian Food Inspection Agency seal of approval for salmon, tuna, or any other form of seafood; in most jurisdictions, processing plants are inspected only once a year, and from day to day they rely on a self-regulating system developed by Pillsbury in the 1950s—essentially an industry honor system. What’s more, consumer fraud is endemic in the seafood trade. Retailers routinely pass off farmed salmon as wild-caught, and imported farmed fish are sold as more expensive fillets of grouper and red snapper. The kind of cheap farmed shrimp found on fast-food menus is often treated with carcinogenic antibiotics, and scallops are soaked in a neurotoxicant used in paint strippers and carpet cleaners. Hole-punches are used on the flesh of skates to create instant ersatz scallops. And processors in countries like India and Thailand use caustic soda and borax to artificially color the shrimp they export to Europe and North America.

It is enough to put you off your dinner.

The Sea, Changed

There is another argument against eating seafood. The indiscriminate catching of fish may be contributing to global environmental collapse.

Over the last decade the evidence has been coming in thick and fast. Rather quickly, the oceans are becoming environments unlike any we have ever known. To make such an observation these days you don't need to be an oceanographer—just an attentive reader of the news.

Dateline, the Pacific Ocean, east of Hawaii: A permanent feature of the world's largest ocean is now a swirling sargasso of floating debris. This gyre of detritus includes Nike basketball shoes spilled from a container ship, Lego blocks, highlighter pens, yellow rubber ducks, six-pack rings, hockey gloves, cans of paint, and disintegrating plastic bottles. Floating amidst the trash are quadrillions of tiny plastic pellets called nurdles that soak up pesticides and deadly chemicals and enter the food chain as toxic pills when they are swallowed by jellies and salps, the zooplankton that are the oceans' most efficient filter feeders. Floating just beneath the surface are ghost nets, lost or abandoned tangles of translucent mesh that fatally entangle sea turtles, albatrosses, seals, and dolphins. The Great Pacific Garbage Patch, as it is known, is now almost the size of Africa.

The Caribbean Sea, off the shores of Puerto Rico: Thanks to unusually high water temperatures, coral reefs in shallow tropical waters are dying en masse. Biologists explain that when the temperature of the surrounding water reaches 90 degrees Fahrenheit, coral polyps start to expel the symbiotic algae that nourish them. In a phenomenon known as bleaching, the dying reefs then turn a blinding white. Others have been blanketed in sediment or covered with seaweed. Thanks to sewage, dynamite fishing, bottom-trawling, and increasing water temperatures, it is estimated that half the coral reefs in the Caribbean and a quarter of the reefs around the world are already dead. Meanwhile carbon dioxide emitted by the burning of fossil fuels is dissolving into the seas and changing their chemistry, a process known as ocean acidification. As ocean pH levels plunge, carbonate and calcium levels diminish in the water: without these building blocks, coral reefs simply stop growing. Computer models predict that, at current rates of greenhouse gas emission, all of the world's coral reefs will be dead by the year 2075.

The South Atlantic, off the shores of Namibia: A stinking, oxygen-free "dead zone" off the coast of this African nation, where nothing but jellyfish can live, has been getting larger from year to year. It is caused by an increase in the amount of algae, tiny floating marine creatures that normally form the bottom of the food chain. The algae were once consumed by sardines, but over the last decade European and Asian fishing vessels have removed 10 million tonnes of these small schooling fish, so the algae bloom now grows unchecked. When it sinks to the bottom of the ocean, the decaying algae rots and releases deadly hydrogen sulfide, a toxic gas that kills off hake, a major food fish for Namibians. Scientists say 150 such dead zones, oxygen-free patches of ocean where no life can exist, regularly crop up from the South China Sea to the Oregon coast. Some of them are now as large as Ireland.

In the first decade of the twenty-first century, it is becoming clear that the world's oceans are being transformed, and not for the better. A paper in the esteemed journal *Nature* reports that 90 percent of the population of top-level predators—among them tuna, sharks, marlin, and swordfish—have already been caught. A team of ecologists makes headlines worldwide by predicting that, at their current rate of exploitation, all major fish stocks will collapse within our lifetimes; the world, in other words, will run out of wild seafood by the year 2048.

For anybody who lives within a hundred miles of a body of water, the fact that the planet's rivers, lakes, and oceans could soon become tepid and acidic wastes, barren of anything but bacteria, jellyfish, and toxic algae, should be disquieting news. For any of us who have spent an afternoon cracking lobsters in a Maine seafood shack, joining a queue on a London backstreet for a battered cod fillet, or feeling that perfect chunk of raw fatty tuna deliquesce over the tongue in a Tokyo sushi bar,

this will sound like a portrait of a poorer world. And for the billion or so of us—I include myself in the head count—who derive most of our protein from seafood, it will sound like a dystopia: a world, in fact, hardly worth living in.

Scientists now know that it is the eating habits of a single species, *Homo sapiens sapiens*, that is driving these changes. Every one of us participates by adding our tons of carbon dioxide to the atmosphere; simply by flushing our toilets or fertilizing our lawns we contribute nitrogen and phosphates that can lead to harmful algae blooms and coral reef death. But the single worst thing we are doing to the oceans is devastating the food chain through overfishing. By knocking out the chain's upper levels (which include such big predatory fish as tuna, swordfish, and shark) and skimming off the middle and bottom levels for industrial use, we are changing, perhaps permanently, the structure of an environment that nourishes us.

Already, bottom-of-the-food-chain sea life that was once considered fit only for bait—jellyfish, squid, cuttlefish—is being marketed as a delicacy. In other words, as the last of the wild tuna and salmon are put into cans, we are in the process of eating our way to the bottom of the food chain. Our future, as one fisheries expert has memorably put it, may be a diet of peanut butter and jellyfish sandwiches.

Like it or not, if we don't start seriously questioning the way we are eating today, we are all going to have to get used to the idea of becoming bottomfeeders.

Bottomfeeding

Seafood is big business, and as awareness of the health benefits of fish eating spreads, so do total sales: worldwide, this \$71-billion-a-year industry employs 200 million people and provides 2.6 billion people with at least 20 percent of their protein. In 2006 Americans bought more than 2 billion six-ounce cans of tuna and tucked away 4.4 pounds of shrimp per person; by volume, the United States is consuming 70 percent more seafood than it did a generation ago. In 2005 seafood for the first time surpassed poultry in total sales in the United Kingdom. Globally, fish consumption has doubled in the last thirty years. Given our eating habits, it is no wonder the oceans are in trouble.

I began writing this book knowing that ours might be among the last generations in history able to enjoy the down-to-earth luxury of freshly caught wild fish. If that was the case, there were a few seafood experiences I wanted to have before I died. My life would not be complete until I had eaten a bowl of rockfish soup within view of the Mediterranean, made according to the official rules laid out in the Marseilles Bouillabaisse Charter. I was dying to try *fugu*, the poisonous pufferfish beloved by the Japanese that, if improperly prepared, can cause a terrifying death by paralysis and asphyxiation. I was curious to confront a plate of *zhui xia*—drunken shrimp, a Chinese dish in which the still-living crustaceans are brought to the table half-drowned in rice wine, their swimmerets still twitching. And I had yet to experience the simple pleasure of fresh grilled sardines eaten in a beachfront restaurant on the Atlantic shore of Portugal, or the taste of a half-dozen fat Chesapeake Bay oysters fried up and served on a soft roll.

When I started planning my voyage, a decade of fish eating had left me half-educated about some of the crucial issues surrounding seafood. I already knew it was better to steer away from such traditionally fetishized predators as tuna, salmon, and swordfish, whose position at the top of the food chain meant they were likely to concentrate toxins in their flesh. I knew that some popular species, like Chilean sea bass and swordfish, were overfished, and certain stocks, most notoriously the

northern cod of the Grand Banks, had collapsed. And I knew it was healthier, for both myself and the oceans, to favor seafood near the middle and bottom of the food chain—mackerel and sardines, tilapia and carp, oysters and jellyfish. I strongly suspected that the best policy of all would be to become a bottomfeeder—by which I mean somebody who routinely eats closer to the bottom than to the top of the oceanic food chain. (Not to be confused with hyphenated bottom-feeders, such as monkfish and lobsters, organisms that actually live and feed on the ocean floor.) Though I had stuffed my wallet with the cards issued by the Monterey Bay Aquarium and other seafood-choice organizations, I was vague about the details of nourishing myself according to these principles. I had heard all the talk about sustainable seafood, but I still was not sure how to walk the walk.

A few words about myself. I may be a fish lover, but I am no fish hugger: I have no ethical qualms about killing fish—humanely—to nourish myself, and while I have never butchered a pig or cow, I have caught, killed, gutted, and cooked fish, and will continue to do so. I draw the line, however, where the pursuit or cultivation of my dinner obviously damages the environment, where cruelty is involved, where pollution or adulterants make it unsafe to eat. I would get no pleasure from knowingly eating a nearly extinct songbird, wine made from tiger bones, or the last few grams of beluga caviar from the Caspian. For me, a pleasure that diminishes the experience of everybody else on earth is no pleasure at all. And saying that fish feel no pain is just a convenient fiction for sport fishermen and Cantonese chefs: too many studies have shown they have pain receptors identical to other animals, and that they clearly demonstrate stereotypical stress motions when injured. There is never any excuse for treating them cruelly. But I also believe that our evolutionary past as omnivorous primates not only justifies fish eating but in a sense demands it: without the fatty acids present in seafood, our brains simply do not develop and function as they should.

I began to plan my journey. It was going to be an international one as, thanks to airfreight and shipping technology, seafood has become one of the most globalized industries there is. Before I was through, it would see me grilling leading New York seafood chefs on their menu choices, snorkeling in a Mediterranean marine reserve, touring great fish markets from London to Tokyo, sneaking marine ecologists into supermarkets, and talking my way into salmon farms and onto fishing boats. Eventually, my journey would take me around the world, from the shores of the North Atlantic to shrimp farms on the Indian Ocean and the polluted waters off China's Pacific coast.

As I set out, the list of seafoods that I enjoyed eating was long. I knew it was going to get shorter but I figured the process would be worth it. I was going to acquire a simple but crucial skill: how to eat nutritious food ethically.

A word of warning for the squeamish: I am an adventurous eater. If it is in the name of research I will try just about anything once. In my travels, I have picked up the habit of eating what the locals eat—whether it is bull's testicles in Spain, fermented candlefish grease in First Nations communities, or llama steak in Bolivia. This book is the education of a fish eater, and getting educated sometimes involves doing things you later regret. But stick with me to the end, and you will pick up a set of principles that will ensure that you can shop for, order, and enjoy seafood, without significantly diminishing the planet's resources or poisoning yourself in the process.

The good news is that there is a way to reconcile conservation, flavor, and health—even when it comes to the complex, multispecies cuisine that is seafood. And it can be done without leaving the oceans, or our plates, empty.

THE RISE OF THE GOBLIN

NEW YORK CITY—*Pan-Roasted Monkfish*

Q: Why are fish so thin?

A: Because they eat fish.

—JERRY SEINFELD

THE MOST HIDEOUS DENIZEN of the deeps you are ever likely to eat is the monkfish, also known as the goosefish, allmouth, bellyfish, molligut, and frogfish. A cross between a goblin and a tadpole, the monkfish has a broad shovel-shaped head that appears to taper into its tail without bothering to pass through the intermediary of a body. With its beady eyes, warty skin, and scowling froglike mouth filled with needle-sharp teeth, the monkfish resembles the flattened Halloween mask of some Texas chainsaw psycho. Scottish fishermen call it Molly Gowan. In parts of New England it is known as a lawyerfish, which gives you an idea.

The monkfish's physiology is beautifully adapted for ambush. It scuttles along the sea bottom using fleshy, handlike ventral fins. Its tiny eyes look like limpets, its fins could be mistaken for clam and its skin is mottled to resemble stones and gravel. Marveling at this design, the Eighth Duke of Argyll wrote: "The whole margins of the fish, and the very edge of the lips and jaws, have loose tags and fringes which wave and sway about amid the currents of water so as to look exactly like the smaller algae which move around them." Virtually invisible, the monkfish entices its prey with a modified spine that juts out of its forehead, trailing a little flag of tissue on the end that acts as a lure. When a shrimp or sand eel tries to take the bait, the monkfish springs upward with a flick of its powerful tail while simultaneously opening its mouth, creating a suction that vacuums up its prey. When pickings get slim below, a hungry monkfish will even rise to the surface: fishermen in Massachusetts have hauled up specimens from depths of a thousand feet with half-digested seagulls in their guts.

This Quasimodo of the Atlantic is not only hideous to look at, but as a bottom-dweller, it is also particularly prone to parasites. I have talked to fishmongers who shudder at the memory of uncooked monkfish flesh—especially the liver, which can be virtually ambulant with marine worms—and privately say they would never eat it themselves. The biggest monkfish grow to five feet in length. If you caught one on a line, you would probably happily throw away your rod and reel just to be rid of the thing.

One weeknight evening in late spring, Eric Ripert, the executive chef at Manhattan's, if not America's, most famous seafood restaurant, has prepared his monkfish tail pan-roasted, in a fanciful tribute to Antonio Gaudí, the eccentric Catalan architect. The sauce is an emulsion of chorizo and white albariño grapes, spiked with spicy sausage that gives the tiniest bite to the quite rubbery, slightly sweet squares of flesh, which are served with crispy *patatas bravas* drizzled in alternating white and red bands of mayonnaise and paprika sauce. At Le Bernardin the ocean's finest fruits are slowly braised, barely cooked, thinly pounded, soothingly presented, and easily digested.

Gaudí, a reclusive vegetarian who deplored excess, would have felt out of place here: Le Bernardin is at the top of all kinds of food chains. Ever since the first Michelin guide to New York consecrated Le Bernardin with three stars, its top rating, a table has to be booked weeks, if not months in advance. In this blue silk and teak temple of seafood, a block away from Rockefeller Center, the money is old, the atmosphere reverential.

“This is the best restaurant in New York, you know,” a snowy-haired alpha male in a gold-buttoned blazer proclaims to his guests (before inviting them to come elk-shooting at his estate). Anticipating the entrance of a matron in head-to-toe Chanel, a hostess gives the revolving door a nudge. Self-effacing young men in black shirts and black ties wage war on tablecloth crumbs with metal scrapers, materializing at one’s elbow like stagehands in a kabuki drama. With the wine pairing and Ripert’s signature dessert—a whole brown egg, hollowed out and filled with milk chocolate, caramel foam, and maple syrup—the bill for the tasting menu is \$295. For your money, you get some of the world’s great delicacies: quail eggs and osetra caviar imported from Iran, foie gras, and wild salmon flown in from Alaska.

For a bottom-feeding monkfish from the shores of Maine, it is all pretty heady company. A decent-sized monkfish used to earn fishermen thirty cents a pound. If, that is, they bothered to land them at all; trawler captains tended to throw them back as unsalable trash fish. But thirty years ago the monkfish experienced an apotheosis: the finger of culinary fashion descended, and this repulsive sea creature was elevated from mere bycatch to ubiquitous entrée, its price increasing tenfold in the process.

Fish à la Mode

“There is a new fish just beginning to appear in the markets around where I live,” wrote Julia Child in the May 1979 issue of *McCall’s* magazine. She had first seen it at a fishmonger’s in New England. “That is to say, it’s not a new fish at all, but one that’s been nosing about in Atlantic waters from Newfoundland [*sic*] to North Carolina ever since fish began. However, we had not paid it any mind until the price of our usual fish became so astronomical that our fishery people began looking more carefully at their catch... Monkfish is what I saw the other day at my fish market—as soon as word gets around there will be demands for it, and it will be shipped all over the country.”

Child herself made sure of that. The cookbook author who introduced French cuisine to the American mainstream memorably wrestled with a twenty-five-pound monkfish on *Julia Child and Company*, showing a national PBS audience how to decapitate the monster and poach its tail. George Berkowitz, founder of the Legal Sea Foods chain, would later marvel, “By mentioning monkfish on her show, she introduced it to America... she could take an underused item and after one show, monkfish takes off and it’s still popular twenty years later.”

Culinary trends can be deadly for fish, driving obscure species that happen to become fashionable to collapse. Particularly in North America, a market of 334 million curious consumers. In the 1980s New Orleans chef Paul Prudhomme, one of the instigators of the Cajun trend, put blackened redfish—a species more commonly known as red drum—on everybody’s lips: by 1986, fishermen were taking 14.5 million pounds a year from the Gulf of Mexico to keep up with demand. Eighteen years later the catch was down to a mere 73,000 pounds, and wholesalers had taken to importing farmed drum from Taiwan and Ecuador.

Pity the fish that catches the wrong eye at the wrong time. If its flesh happens to be tasty enough

its fate is sealed, and ships with the latest satellite technology will chase it to Antarctic seas and oceanic abysses to keep plates in London, Tokyo, and New York filled. Analyzing the decline of predator fish in the Atlantic, ecologists Boris Worm and the late Ransom Myers concluded in a paper published in *Nature* in 2003 that it took only fifteen years for an industrialized fishery* to reduce the biomass (the combined weight of all the organisms) of a targeted species by 80 percent.

In 1978, Massachusetts's fishermen were getting thirty-five cents a pound for monkfish. Three years later, thanks to Child's advocacy, the price had almost doubled, and an obscure bottom-feeder was on its way to being declared overfished.

For the monkfish, things have never been the same.

The Goblin at the Market

These days, a trip to the New Fulton Fish Market is a sobering experience. It used to be a drunken one. In the nineteenth century, slumming citizens would stop for soft-boiled eggs and a dozen bluepoints at its many oyster stands. Late into the twentieth century, it was a place where guys with Run-yonesque names like Johnny Dirtyface could disinfect a knife wound with half a bottle of whiskey, drink the rest, and still set a record for filleting shad.

At four o'clock in the morning, the South Bronx is a lonely place. I walked through the New Fulton Fish Market's security gate, where drivers must now pay six dollars just to enter the floodlit parking lot, and entered the market by a side door. Inside, the building was a horizontal bunker the size of an upended Empire State Building lit with all the charm of a bus station. I had come looking for trouble: a face-to-face encounter with a freshly caught monkfish.

I have a theory about the great fish markets of the world. When a metropolis loses its central market, it also loses its belly, and with it, its soul. (Though, in New York's case, perhaps *id* is the apposite term.) Paris, I knew, had given up its lumpen-*âme* in 1969 when the city center food market Les Halles, that haven for the inebriated in search of a late-night onion soup, moved to suburban Rungis. The relocation of the Fulton Fish Market to Hunts Point in the Bronx in 2005 was the culmination of years of gentrification and confirmed something old-time New Yorkers have long known: whatever is left of the class-mixed, gritty Manhattan of legend moved to the boroughs a long time ago.

On either side of the New Fulton's central corridor, there were signs over crates and sinks every dozen yards or so announcing the leading purveyors to New York's restaurateurs: Slavin, Blue Ribbon Gloucester Fish Company, Smitty's Fillet House. Fulton's new location has not stopped the chefs and retailers from coming, and for the thirty-seven wholesalers who survived the move, business has apparently improved. In 2006, the market sold 250 million pounds of fish, putting it second only to Tokyo's Tsukiji in terms of volume.

An employee at Frank W. Wilkisson, Inc., seemed happy to take a break from unloading boxes of fish from a hi-lo, one of the miniforklifts that crisscross the market floor. Casually dangling a steel gaffing hook from the shoulder of his white smock, Nick Dantuono talked of all the changes he had seen in his thirty-three years at the market.

"Cod used to be really big, like so," said Dantuono, extending the palm of his right hand a foot past the tail of a slimy specimen sitting on a bed of ice. "We'd get the market cod—the smaller cod with its head still on—and steak cod, which came with the head already off. We used to see a lot more Atlantic pollock and haddock, too, but suddenly that stuff dropped off. All the cod gets snapped up by

the processors to make fish fingers now; it never even gets here.

—“With air freight, the whole world opened up to us about ten years ago. Now they can catch swordfish in Australia, bluefin tuna in the Mediterranean—any place on earth, really—and they’ll put it in a Styrofoam box and within twenty-four hours, bang, it’s here.” He explained that his company was now making most of its money from a fish called whiting. For every red snapper from the Gulf of Mexico, he said, they sold a hundred pounds of whiting from Nova Scotia. A foot-long Atlantic forage fish with bland, pale flesh, whiting was actually the market’s most popular fish. Dantuono figured they sold fifty tonnes* a week, mostly to fry shops in African-American neighborhoods.

Looking around, Dantuono said he had to admit the new market was a lot cleaner than the old. There were stainless steel tables everywhere, floor drains and sinks, and you no longer had to wear a hat to keep the pigeon shit off your head. Most important, the Styrofoam boxes no longer sat under FDR Drive for hours in one-hundred-degree heat. The entire building was chilled to a fish-friendly forty degrees.

“The thing is, there’s no atmosphere here,” said Dantuono. “In Manhattan you had the pier, you were on the street, you felt like you were part of the city. Here it’s more like being in a box. You don’t get the people coming off the street. It was nice. We liked that.”

Inspecting the wares of other vendors, I saw that exotic fish, once a rarity, were now a market staple. In fact, parts of Fulton looked like a casting call for *Finding Nemo*. I recognized parrotfish from Antigua and a berry-eating fish called the tambaqui from South America; there were butterflyfish, grouper, sea robins, and an iridescent and exophthalmic deep-sea species called orange roughy. It was a sign of the times. Rather than North Atlantic staples like cod, haddock, and tuna, New Yorkers were now eating aquarium fish, taken from distant, already-picked-over seamounts and coral reefs.

I continued my quest for the hobgoblin of the deep. It was not difficult to find: every dealer seemed to sell monkfish, from Montauk Seafood (which displayed them pre-decapitated) to South Street Seafood (where they were sold already filleted). The tails went for \$3.25 a pound—meaning the retail markup is severe: Manhattan restaurants charge as much as \$25 for a six-ounce serving. When an employee at Blue Ribbon Fish, supplier to some of the city’s finest restaurants, noticed me eyeing his wares, he asked: “Can I show you a real interesting fish?”

Plunging his gaffing hook into a Styrofoam box, he pulled up a kind of drooping, slimy jabberwock with a bulldog’s grin. The monkfish, it seemed, had found me: I was looking at a perfect twenty-five-pound specimen, landed in Cape May, New Jersey, the day before. It was even more hideous than I had thought it would be, its brown skin glistening toadlike in the fluorescent light.

“It hides in the sand,” the Blue Ribbon man explained, “and uses this little pole to fish.” He tugged at the filament projecting out of the monkfish’s forehead. “This little black membrane kinda looks like a worm to any fish passing by. He just wiggles it around like that, and then—*whooooo!*” With a yank on the gaff hooked beneath the monkfish’s upper jaw, he made the monkfish leap upward. Right toward my nose. Twin lines of pointed teeth loomed as a maw the size of a dinner plate opened. When I involuntarily leaped back, the vendor laughed. “Gets ’em every time!” he roared, as his buddies chuckled. (Fishmonger humor, I would learn, is an acquired taste.)

Maybe I had gotten off easy with a monkfish to the face. People who got out of line in the old Fulton, after all, used to end up swimming with the fishes. In its South Street location the market had been a notorious haven for organized crime, and syndicates skimmed huge sums from the tills of fish dealers over the years. The Genovese family was accused of using bogus unloading and security companies to turn Fulton into a private laundromat for ill-gotten cash.

It all meant you had to be careful what you bought in Fulton. One dealer was arrested for selling

wild striped bass from the lower Hudson River, illegal because it is so full of pollutants. It turned out he had been peddling his stock to other Fulton wholesalers; eventually thousands of pounds of fish tainted with polychlorinated biphenyls, highly toxic industrial chemicals, made it to the plates of some of Manhattan's finest restaurants. In 1995 then-mayor Rudolph Giuliani started an aggressive campaign of licensing and background checks. Any fish dealer who had the slightest criminal record was fired. Within a few months thirty companies were ejected. The cleanup turned out to be a good thing for the city's fish lovers: prices fell, and trading volumes at Fulton jumped by 50 percent.

Not that seafood fraud has stopped altogether. Far from it. There is a good reason that monkfish is called the "poor man's lobster."

Bait and Switch

Seafood fraud is not that hard to pull off: when it comes to passing off one species for another, fish dealers have proven all too willing to take advantage of the fish-eating public's lack of taxonomic rigor.

Take the words *sea bass*. They appear in the names of one hundred different species, only a few of them related to one another, from chain-gang sea bass to Chilean sea bass to striped sea bass. Meanwhile, in Italy, a single species of fish, the common gray mullet, is known as *cefalo*, *muletto*, *muzao*, and thirty-seven other names. (Nothing would kill sales of overfished species faster than forcing restaurants to use their real names. The orange roughy, for example, is known in New Zealand as slimehead. Mahi-mahi was originally called dolphinfish—and nobody wants to be accused of eating a dolphin. And in England, fish and chips shops should certainly be forced to sell rock salmon by its real name: spiny dogfish.) Unlike *beef*, *pork*, and *chicken*, *fish* is a generic term for a wide range of animals: all told, 350 species of seafood can be found in markets in the United States. It is not difficult to pass off one species as another, and even easier to label farmed fish wild-caught. Depending on where you live, if you eat seafood in restaurants a couple of times a week, you will almost certainly be the victim of fraud at least once, and maybe twice, a month.

Every part of the world has its endemic form of fish fraud. In the American Midwest walleye often turns out to be zander, a cheap white-fleshed fish imported from Europe. In Australia barramundi is replaced with the cheaper Nile perch, imported from Africa. In Canada the cod on diners' plates is often actually haddock. In South America sharks are filleted, relabeled, and sold as tuna. In 2007 England's Food Standards Agency discovered that 15 percent of the fish being sold as wild-caught was actually farmed. Incorrectly labeled fish were even discovered at such respectable retailers as Harrod's.

Fraud is not necessarily on the rise among fishmongers. It is just that new technology has been catching up with old practices. Accurate DNA tests are now relatively cheap, and a New York State lab has devised a way to test fish samples even after they have been cooked; the lab work can cost less than \$200. The *Chicago Sun-Times* in 2007 found that out of fourteen local Japanese restaurants offering red snapper, four were in fact serving red sea bream, and the remainder were using tilapia, a bland farmed fish. All told, three quarters of the snapper sold in eight states turned out to be some other species.

The most common scam of all centers on grouper. This bulbous, Jagger-lipped reef fish is a southern state favorite: grouper sandwiches are as much a trademark of coastal Florida as key lime pie and roadside panhandlers. Three quarters of the U.S. catch comes from the Gulf of Mexico, but the fishery went into decline in the 1980s, and when the National Marine Fisheries Service (NMFS)

introduced two-month closures, importers took advantage of the gap in supply. Ordering grouper in south Florida, local television stations found, might get you hake, emperor fish, green weakfish, or even painted sweetlips—a whole *Underwater World* of species, none of them grouper. The most frequently substituted species were such farmed Asian catfish as basa, ponga, and swai, which were often treated with dangerous antibiotics and fungicides. Even such major chains as Boardwalk Billy's, R.J. Gator, and McCormick & Schmick's were found to be serving catfish rather than grouper. Some restaurants may have been genuinely unaware of the substitutions: investigators found that the shipping boxes were usually labeled grouper (though many kitchens had conveniently lost their invoices). It is difficult to believe, however, that everybody was fooled. Real grouper wholesales for \$10 a pound, but some Florida restaurants were offering all-you-can-eat specials for \$7.99. In 2006 a Florida importer ended up taking the fall for the grouper scam; he was sentenced to an astonishing fifty-one months in prison.

Monkfish, it turns out, is one of the most popular fraud species. With this particular fish, however, it is the restaurateurs, not the wholesalers, who tend to cheat.

Here is a recipe for making a dish of pasta with lobster sauce last in your trattoria for a week—for less than a hundred and fifty bucks. Buy two whole lobsters and forty pounds of cheaper monkfish tail. Combine the cooked meat from the two species, sauté in butter, add heavy cream, some brandy, and some parsley, and cover your linguini with the sauce. There is no need to mention the monkfish on the menu: after all, you are simply making your lobster linguini in cream sauce stretch a little.

And that is why it is accurate to call monkfish “poor man’s lobster.” Too bad the poor man is usually the last to know.

The Goblin’s Apotheosis

Having gained Julia Child’s imprimatur, the once-scorned monkfish became a sought-after table fish.

Traders soon discovered that the monkfish was the possessor of an organ that, like the gonads of sea urchins, already had a cult following abroad. While sea urchin roe distills the essence of the tideline of some unpolluted Pacific beach, the liver of the monkfish captures the quintessence of a more corrupt body of water. At first bite the foamy loaf tastes like a mouthful of Sargasso, of rotting kelp and whale parts, before swerving toward the creamiest of foie gras. Fetching up to \$19 a pound at market, the livers are shipped via Boston’s Logan Airport to the sashimi emporia of Japan and such Parisian seafood temples as La Coupole. Monkfish liver never really caught on in the United States; even in such sophisticated markets as New York, tastes that flirt with putrescence can be a hard sell. Or maybe the problem lies in the name: after all, the French *foie de lotte* and the Japanese *ankimo* sound a lot better than plain old monkfish liver.

As the monkfish’s popularity grew, catches started to decline. In the 1990s, in spite of a series of ultimatums from the federal government, the New England Fishery Management Council, one of eight regional bodies in the United States responsible for setting fishing quotas, refused to establish a management plan for monkfish. Catches peaked at 28,000 tonnes, but the nets were coming up filled with small and juvenile fish, and federal officials estimated that by the mid-1990s the population was at its lowest levels since trawl surveys had started thirty years before. In 1999, twenty years after it came to Julia Child’s notice, the monkfish was officially declared overfished, and quotas were finally set.

By then, it was probably too late. Monkfish is now big business, and fishermen have proved all

too willing to risk penalties to cash in. According to the trade journal *SeaFood Business*, monkfish now earns fishermen \$50 million a year, making it the single most valuable species caught off the east coast, beating out cod and flounder. After temporarily classifying monkfish stocks as “rebuilding,” the NMFS again declared monkfish overfished in 2006. In spite of all the evidence of declining biomass, the fishing continues.

As I strolled through Manhattan reading menus, every seafood restaurant, and some others besides, seemed to be featuring monkfish. Picholine on West Sixty-fourth was doing it osso bucco style, with a rich Spanish romesco sauce. Nobu on Hudson Street was offering a cold pâté of monkfish served with caviar. At Vong on East Fifty-fourth, the Alsatian master Jean-Georges Vongerichten was serving it baked with special spices. At Midtown’s Russian Tea Room it was being served *ukha* style—as a fish soup—with Dungeness crab broth. Even the down-to-earth, always-packed Mary’s Fish Camp in the West Village was serving it pan-roasted. It was not cheap: as an entrée, an order of monkfish tail averaged \$22.50.

Though monkfish is far from endangered, it is definitely overfished: on the Monterey Bay Aquarium’s Seafood Watch wallet card, it is red-listed in the “avoid” column. Even if it were as abundant as lobster, though, monkfish would still be a fish to avoid for one reason: the way it is caught.

The Trouble with Monkfish

The monkfish’s bottom-dwelling ways were once its best defense against fishermen. Long ago, however, technology caught up with it.

Lophius americanus, the species served in American restaurants, can be found from the Gulf of St. Lawrence to northern Florida, lurking on coastal shelves at depths of up to half a mile. (On the European side of the Atlantic, the closely related monkfish species *Lophius piscatorius* has recovered since severe restrictions on the Scottish fleet allowed declining populations to rebound. In 2007, the Asda supermarket chain announced that it would sell monkfish again. The Marine Conservation Society’s Good Fish Guide now lists monkfish as a “fish to avoid” only if it comes from certain overfished stocks.) Monkfish prefer habitats like the Hudson Canyon, a submerged cleft scoured into the continental slope by the meltwater from retreating glaciers, extending from New York’s harbor almost five hundred miles into the Atlantic. Rich ecosystems for lobsters, sharks, and yellowfin tuna such canyons are within striking distance of Gloucester, New Bedford, and other New England ports. In U.S. waters most monkfish are caught with bottom-trawls, cone-shaped nets that rake the sea bottom at speeds of two to six knots. Even the smallest trawlers now rely on precision satellite navigating and computer imaging for tracking fish. In areas that once provided safe haven for bottom feeders, canyon-busters, tickler chains, and rockhoppers (heavy steel and rubber wheels that can jump huge boulders) scour every cranny in the seafloor.

Against such technology, even the best-camouflaged monkfish does not stand a chance. A trawl’s bottom edge dislodges the fish from their lairs and knocks them into the net, raising choking sand clouds as it carves gouges into the seabed. The nets are not selective; about 22 percent of the monkfish catch consists of other species, especially the overfished skate. Too many of these unwanted fish, known in the industry as bycatch, are thrown back into the water, dead or dying.

“Don’t demonize one type of fishing gear,” implored a spokesperson for the National Fisheries Institute, a trade organization that defends the interests of American fishermen and processors, when

conservationists started campaigning against bottom-trawls. Yet when biologists, fisheries managers and fishermen themselves were asked to rate types of fishing gear on a scale of 1 to 100—with 100 being the most destructive—they overwhelmingly ranked bottom-trawls as the worst. Purse seines, nets that can be selectively cinched around schools of sardines or tunas, received the lowest rating, 4, and lobster-style traps scored an acceptable 38. With a rating of 91, bottom-trawls were found to be by far the most destructive, in terms of habitat impact and bycatch, of the ten fishing methods surveyed. Bottom-trawls, fishermen and scientists alike agreed, should also be the most stringently regulated.

If the floor of the ocean were a featureless plain populated only by economically useful groundfish, then the bottom-trawl, now one of the most commonly used methods of catching fish, might be a relatively benign technology. In reality, many parts of the seafloor are complex three-dimensional habitats, about which we still know far too little. Eighty percent of the ocean is more than a mile deep, and these deep-sea areas are continuous, so that the basins of the Atlantic, Pacific, and Southern oceans actually connect. Though vast stretches of the sea bottom are muddy abyssal plains crossed only by large species like tunas and whales, even these underwater deserts contain crucial oases of life. In the last decade alone explorers have charted submerged hydrothermal vents ten thousand feet beneath the surface, crowded with life-forms that evolved without sunlight. Since the first of these vents, nicknamed black smokers, was discovered in 1977, a new vent-dependent species has been identified on average every ten days. Among them are blind shrimp, lobsters, anemones, and giant 250-year-old tube worms that feed on bacteria capable of metabolizing the hydrogen sulfide spewed from the earth's crust. Some speculate that life on earth may have begun around such vents, and could well develop on distant planets in a similar fashion.

The oceans also hide at least fourteen thousand major seamounts, submerged peaks where uprushing currents deposit nutrients, creating areas akin to watering holes in the African savannah. Small in total area, seamounts are important refuges for the oldest and largest fish—which also tend to be the most fecund. Like tropical reefs, they are home to deep-water corals that can be four thousand years old, and provide habitat for the hairy seadevil, the umbrella-mouth gulper, the roughhead grenadier, and other little-studied deepwater species. (The grenadier has special rods for night vision that allow it to see two hundred times better than humans, and has a special gland that, when squeezed, causes luminescent bacteria to light up, providing the fish with its own deep-sea flashlight.) When scientists recently reached one of these seamounts off a remote part of Australia, however, they found it had been scraped clean by bottom-trawls.

“Imagine using a bulldozer to catch songbirds for food—that’s what it’s like,” says Sylvia Earle, an American biologist who has led more than sixty deep-sea expeditions, describing the devastation of bottom-trawling. “Before trawling, you see eyes that look out from all the little crevices, crannies, burrows, and little hills... After a trawler has gone by, it looks like a superhighway, it’s just flat. Nobody’s home. A few fish may swim in and out, but the residents, those that occupy the substrate, they’re just smothered, they’re crushed. It’s like paving them over.”

Not much can stand in the way of supertrawler nets, whose mouths, held open by doors that can weigh thirteen thousand pounds each, are big enough to swallow whole cathedrals. The steel rollers that keep the net off the sea bottom plow through corals, sea fans, sponge gardens, gorgonians, and other fragile, centuries-old structures like street plows going through snow forts. In the Gulf of Maine repeated trawling with heavy gear has flattened species-rich underwater hills into mere bumps on the seafloor. Biologists believe that, thanks to bottom-trawls, species after species is becoming extinct before science even has a chance to describe them. We are, in effect, clear-cutting the oceans: sea bottom scars two and a half miles wide have been found off Norway, where 40 percent of cold-water

reefs have already been damaged by trawls. Off the coast of Florida bottom-trawling has ground 90 percent of the state's fragile *Oculina* coral reefs into rubble.

Amazingly, some trawls can go down 7,500 feet—almost one and a half miles—putting a quarter of all known seamounts within reach of the world's fishing industry. Moreover half of them are within international waters, beyond two-hundred-mile national limits. For the world's trawlermen, these 75 million square miles of unregulated ocean represent the last frontier, where they can fish without worrying about red tape or environmentalists. Although there are fewer than two hundred of these vessels on the high seas, they are amazingly efficient: every year they manage to scour an area of sea bottom twice the size of the continental United States. Obscenely, the world's governments subsidize the industry with \$152 million in taxpayers' money every year. Without this public money, the world's high-seas fleets would operate at a loss.

When the proposal for a moratorium on high-seas fishing came up before the United Nations in 2006, a thousand scientists worldwide signed a petition asking for a total ban, a measure supported by Great Britain, Australia, and the United States. A few key fishing nations opposed the petition, and tiny Iceland finally blocked the moratorium. A watered-down agreement was eventually signed, allowing some of the most rapacious nations, like Russia and China, to police their own vessels. Russia, which gives \$30 million a year to its deepwater trawl fleet, has since announced plans to increase its fishing activity on the high seas.

Canada also opposed the moratorium, even though none of its own trawlers worked outside its two-hundred-mile limit. What was the motivation? The federal government wanted to protect Canada's inshore bottom-trawling sector, an industry worth half a billion dollars a year to the economy of Nova Scotia alone.

Worried that a high-seas ban would affect the lucrative fisheries for shrimp, plaice, and scallops, the biggest players in the Canadian industry fought back with shamelessly misinformed assertions: "There is zero scientific evidence, not one shred of scientific evidence, that these [bottom-trawling] fisheries do any damage to the bottom environment whatsoever," John Risley, the president of Clearwater Seafoods insisted to a room full of reporters in 2006. (The exact opposite is true: there are volumes' worth of scientific papers showing that fragile coral reefs have been decimated by Canadian trawlers, some of them right off Nova Scotia's coast.) Asked point-blank by a reporter if Canada's refusal to support the moratorium was driven by a desire to protect big fishing companies like Clearwater, Canada's federal fisheries minister replied: "Certainly it is part of the decision." He went on to explain: "If we banned bottom-trawling across the board, we would wipe out many of the coastal communities in Canada." In truth, fishing communities have more to fear from the long-term effects of high-seas bottom-trawling, the most definitive destroyer of ocean habitat yet invented, than from any moratorium.

And that is the *real* trouble with monkfish: not only are they caught with bottom-trawls that tear up fragile nearshore seafloor canyons, but protecting this fishery, and fisheries like it, has also provided justification for the destruction of fragile seamounts. When you add up the costs, the bill for poor man's lobster, that staple on the white tablecloths of North America, is simply far too high.

I had seen worse things in New York's markets and on its menus than monkfish: for example, orange roughy, an endearing, bug-eyed deep-sea fish that grazes on seamounts, can live to be 150 years old, and does not start reproducing until the age of forty. Much of the pillaging of the deep seas has been done in pursuit of this single species; the Australian government officially listed orange roughy as threatened in 2006.

It is impossible to overstate what a bad idea fishing for such deepwater species is. The fact that

we are dragging nets one and a half miles below the surface should suggest how difficult it has become for humanity to find wild-caught protein. It is as if, after shooting most of the birds in Europe and North America, we have resorted to burning down the Amazon so we can catch the fleeing parrot and macaws in butterfly nets. And then eat them.

Wandering through the Village one afternoon, I paused on Thompson Street, between Third and Bleecker, and idly read the menu in the window of a Thai restaurant. The day's special was seared orange roughly from New Zealand, probably one of the last of its kind, served with a red pepper purée. At \$14.50, it was a real steal.

It is true what they say about New York. You can find anything in this town.

Blacklisting the White Tablecloths

While culinary trendsetters have the power to drive fish to commercial extinction, a person who convinces the public to rethink its eating habits can actually save a species. In 1987 a biologist named Sam LaBudde got a job as a chef on a Panamanian tuna fishing boat. Using a Sony Camcorder, he videotaped dolphins being drowned in purse seine nets as the boat hunted yellowfin tuna in tropical waters. Aired on CNN, ABC, and *Today*, the shocking footage, which showed dolphins shrieking as the nylon nets tore away their fins, instantly changed people's eating habits; tuna sales immediately plummeted. By 1990, when polls revealed that 60 percent of the American public was aware that the canned tuna industry was responsible for killing hundreds of thousands of dolphins, such major canners as StarKist, Bumble Bee, and Chicken of the Sea announced that they would purchase only tuna taken using nets with panels that prevented dolphins from becoming fatally entangled.

Buying "dolphin-friendly" tuna was probably the first conscious ethical seafood-purchasing choice North American consumers ever made. In 1998 two conservation organizations, SeaWeb and the Natural Resources Defense Council, teamed up to launch the "Give Swordfish a Break" campaign. Fishermen and fishmongers had been noticing a disturbing change in the size of this spectacular trophy fish for years: swordfish weights dropped from an average of 260 pounds in the 1960s to one hundred pounds twenty years later, and "puppies" under fifty pounds were routinely being sold at Fulton and other fish markets. As prices skyrocketed, swordfish became a culinary cliché in restaurants across Europe and the United States, favored by chefs for its firm, beefsteaklike flesh. Fishermen started using longlines, up to fifteen thousand baited hooks on lines that were so long—twelve miles or more—they could take an entire day to haul in, killing sea turtles and dozens of other species that also took the bait. Eventually seven hundred chefs and three cruise lines signed a pledge not to serve swordfish.

The next species selected for boycott was a deep-sea monster known to biologists as the Patagonian toothfish. Brought to American tables for the first time by a Los Angeles importer in 1977, it was redubbed Chilean sea bass; by 1990 it was being served at the Four Seasons in New York, and in 2001 *Bon Appétit* magazine named it their "Dish of the Year." A year later, with stocks near collapse, it was the subject of a boycott. The "Take a Pass on Sea Bass" campaign, launched by the National Environmental Trust, was successful in calling attention to overfishing. To this day, many high-profile restaurants refuse to serve Chilean sea bass.

At best, however, such boycotts are blunt instruments. Even the most focused of them can unfairly penalize fishermen who fish sustainably. In her memoir *The Hungry Ocean*, swordboat captain Linda Greenlaw expressed her frustration with the impact the swordfish boycott was having on

her livelihood: “I wonder how these chefs keep themselves abreast of the state of the fishery and how they can be so conceited to presume they might know better than the fishermen and scientists who have been working together for years to keep the stocks healthy. In my opinion, little Chef Fancy Pants should work at perfecting his creme brulee and leave fisheries management to those who know more about swordfish than how best to prepare it.” Many swordfish in the Pacific are taken by harpoons or handlines, which are singularly sustainable methods of fishing. Thanks to the campaign, however, in the public mind, all swordfish has become *verboden*. (Greenlaw, incidentally, now fishes for lobster.)

Yet there is no denying that a well-run public awareness campaign can save certain fish populations from commercial extinction. Some Atlantic swordfish stocks, for example, are now on their way to recovery. After chefs removed striped bass from menus, it took only five years for stocks to begin to improve. The impact of the “Take a Pass on Sea Bass” campaign is less clear. Populations have recovered since the campaign started, and a single fishery has been certified as sustainable—which is why you can now find the once-forbidden fish at Whole Foods and Wal-Mart. Yet 40 percent of Chilean sea bass on the market is still caught illegally, which means that a consumer who finds the fish on the menu of a cruise ship or a midmarket seafood restaurant has no way of knowing if it was caught by a pirate ship. Critics argue that the existence of a single certified fishery can put the stamp of sustainability on a species that may still be in serious trouble.

To highlight their distance from questionable sources, many leading chefs have started peppering their menus with qualifiers, emphasizing that their tuna is “hook-and-line” (suggesting there is little bycatch), their cod is “dayboat-caught” (by small, inshore boats), their scallops are “diver-harvested” (by hand), or their grouper is “wreck-caught” (from around sunken ships). Taking their cue from Alicia Waters of Berkeley’s Chez Panisse, whose menus specify the valleys and counties from which her peaches and goat cheeses come, some seafood chefs even indicate the fishing port or state that a fish comes from. And thanks to vigorous promotion, Copper River and Yukon king salmon are becoming familiar brands of sustainably caught Pacific salmon.

Yet in their cookbooks and showcase restaurants, America’s star chefs seem to have a blind spot when it comes to serving overfished seafood. *Charlie Trotter’s Seafood*, by the renowned Chicago chef, features recipes for raw red snapper, steamed cod, and baby monkfish tail. Manhattan’s BLT Fish, run by star chef Laurent Tourondel, makes a pious nod toward ecological correctness, noting on its menu: “Most of our fish are line caught, our scallops are harvested by divers and the lobsters are flown in from Maine.” When I visited his restaurant, however, Tourondel was still serving such severely overfished species as red snapper, skate, halibut, monkfish, and bluefin tuna.

Nobu Matsuhisa, whose empire of thirteen restaurants was founded with the financial help of Robert De Niro, has written the most stunningly profligate cookbook of them all. In *Nobu: The Cookbook*, amid recipes for Chilean sea bass, abalone, grouper, and red snapper, Nobu devotes an entire section to *toro*, the fatty belly meat of the critically endangered bluefin tuna. “Many Japanese, including myself,” Nobu wrote, “would naturally have some resistance to ‘wasting’ a fillet of *toro* by not serving it raw. Fortunately, however, my American customers are free from such prejudices and are able to enjoy *toro* steak on its own terms.” This is a fish that has lately become so rare in Japan that sushi chefs have been forced to replace it with horse and whale meat. Yet Nobu is hardly alone: virtually every Japanese restaurant in Manhattan serves this most preeminent of predators.

Morimoto, a Japanese restaurant in Chelsea, even boasts a bluefin tuna pizza, spiked with anchovy *aïoli*.

The Raw, the Cooked, and the Extinct

By value, 68 percent of the seafood eaten in North America is ordered in restaurants. From a Friday-night duty for Catholics, fish has become the prestige protein at the center of the American plate. In New York, where diners can choose among 26,000 restaurants, one in every five dining dollars is now spent on fish.

Esca, leading critics agree, is the most original seafood restaurant to open in New York in years. (*Esca* is the Italian word both for bait and for the little membrane the monkfish uses as a lure.) Its success was heralded by a glowing 7,500-word feature in the *New Yorker*, in which the writer observed that Esca is the only place in town that offers “year-round wild game that has been personally bagged by the chef.”

The dinner atmosphere at Esca on a Thursday night was remarkably relaxed: it was part French bistro, where diners crowded elbow to elbow seemed naturally to fall into conversation with one another, and part Mediterranean-themed trattoria, where the trim, relaxed wait staff joked with ease, while never crossing invisible lines of decorum.

I had come for the *crudo* tasting menu and was not disappointed. Presented on glass plates, the raw and barely cooked seafood seemed to float beneath me like Platonic ideals of themselves. There was a single plump wild Belon oyster from Maine, its flat shell nestled in a bed of ice. I savored an uncooked rectangle of weakfish, studded with irregular pieces of crushed almond. Finally and most exquisitely, there was a single razor clam, whose flesh had been removed, mixed with red chiles, scallions, and mint, and then stuffed back into the shell, so it looked like a canoe full of Christmas presents. These *crudo* flights, sampling freely from many levels of the food chain, were a model of their kind. The rest of the menu, however, was a problem.

I pointedly refrained from asking the waiter whether the seafood was fresh. At a joint like Esca, such a gaffe would display as much expertise as kicking tires in a used car lot.

In the seafood industry freshness is a loaded term. In most sushi bars, for example, the fish arrives in frozen bricks that are cut into pieces with wood-cutting saws; the Food and Drug Administration insists that fish that will be served raw first be frozen to kill parasites. (Tuna are the exception: as fast swimmers, they tend to be naturally parasite free.) The vast majority of midmarket and chain seafood restaurants work with frozen fish, and consumers are probably better off this way. While well-iced warmwater fish, especially catfish, snapper, and other lean species, can stay edible for up to three weeks, salmon, mackerel, and other fatty coldwater species remain fresh only for about a week. By the time that “fresh” cod gets to your table, it may have been sitting on ice on a fishing vessel for ten days. Before that, it may have been violently tumbled and crushed, often for hours, at the rear end (known as the cod end) of a trawler’s net. A frozen-at-sea fish, in contrast, chilled to—70 degrees Fahrenheit minutes after it is caught, can stay cryogenically preserved in perfect condition for up to two years, to be thawed just a few hours before the chef needs it. Modern liquid-nitrogen “snap freezers” work so quickly that the moisture does not have time to crystallize, preventing a mushy thaw.

Contrary to popular belief, though, fish should not be served *too* fresh. The muscle fibers of a just-killed fish temporarily lock into rigor mortis, making its flesh as tough as shoe leather and just about as easy to cut. Like beef, fish needs to be aged: it takes between eight hours and a day for rigor to end and enzymes to start breaking down proteins, softening the flesh and releasing the amino acids that are essential components of flavor. (The enzyme-filled flesh of crustaceans starts auto-digesting into pablum at the moment of death—which explains why good restaurants keep their lobsters alive in

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