

03.

**FISH OR  
CUT BAIT:  
SOLUTIONS FOR  
OUR SEAS**

**CARL SAFINA,  
CARRIE  
BROWNSTEIN**

## EDITORS' INTRODUCTION

In 1497, explorer John Cabot set sail from Bristol, England, looking for China. Born in Portugal — his name was originally Giovanni Caboto — Cabot had searched throughout Europe for a sponsor for his extravagant voyage until he had found backing from Henry VII of England. Cabot imagined riches of perfumes, silks, and exotic spices such as ginger, cinnamon, and pepper, which at the time were rare and very expensive commodities.

Cabot, of course, never found his way to the spices of China, but he discovered an equally valuable resource on his journey: the North Atlantic cod fisheries. He reported that the waters off Newfoundland were so “swarming with fish, which can be taken not only with the net, but in baskets let down with a stone.”

After Cabot’s discovery, fishermen came from Europe in droves to fish in these plentiful waters. It is estimated that over 10 million European fishermen followed Cabot’s journey to fish the Grand Banks. For centuries the bountiful fish stocks were able to replenish themselves and to provide ever-growing quantities of fish for Europe and North America. And as the fishing vessels increased in size, and the catches continued to climb, the cod fishery claimed an unparalleled role in the economy of the Northeastern region of North America.

By the mid-twentieth century, a new kind of fishing vessel began to show up on the Grand Banks. The first of its kind was a

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Scottish ship called The *Fairty*, a 85-metre-long behemoth weighing over 2,600 tonnes. The *Fairty* was a floating, 24/7 fishing factory. It used technology such as sonar to find the fish stocks, had enormous winch-operated nets capable of pulling in hundreds of tonnes of cod at once, and carried a full processing plant on board. As a result of these new, highly efficient fishing boats, the catch continued to climb exponentially. It reached a peak in 1968, with a catch of 810,000 tonnes of Atlantic cod that year.

Most of us already know the rest of this unfortunate story: the Atlantic cod fisheries collapsed from overfishing in the early 1990s, and despite a decade of drastically reduced fishing — resulting in unparalleled hardships visited upon the communities that had relied on the industry — the fish numbers have yet to rebound. A vital resource worth billions of dollars that fed generations has been largely destroyed within our lifetime.

The story of the North Atlantic cod fishery is not unique. Across the globe, fish populations have dropped precipitously as the mechanized efficiency of our fishing fleets — encouraged by billions of dollars in governmental assistance — has pushed our oceans to their carrying capacity and beyond. It is an awareness of this crisis that has motivated most of the work of Carl Safina. He is president and co-founder of the Blue Ocean Institute, a not-for-profit organization that is “dedicated to building a wider, more inspired cultural atmosphere for ocean conservation through science, art, and literature.” He has teamed up with Blue Ocean writer and researcher Carrie Brownstein to write the following article, which tracks the history of fishing in our century and tries to show some ways that we may be able to renew our relationship with our damaged oceans.

## ONE MAN'S STORY

At ninety years old, Fritz Goldstein still remembers with sharp precision the details of his lifetime in the seafood business. Stationed at his kitchen table in the outskirts of Philadelphia, his ancient eyes light up as he recounts tales of a career journey he can still scarcely fathom. Who would have known, his expression conveys, that in the early 1900s the son of a Russian immigrant fishmonger could grow up to participate in the growth and globalization of the modern seafood industry?

In his early years, Fritz awoke at three o'clock each morning to haggle with local dealers at his father's wholesale fish market on Philadelphia's bustling Dock Street. He was a fifteen-year-old with a tight schedule; after work he still had to make it across town before the first school bell rang. Fritz sold freshwater carp and whitefish hauled from the Great Lakes and the relatively more pristine waters of Wisconsin and Nebraska. The saltwater fish — croakers and porgies — travelled a shorter distance; all were caught off nearby Cape May and Wildwood, New Jersey. It was the Depression in the United States and fish was cheap — five dollars for a hundred-pound box.

The gruelling and unglamorous life of a fishmonger was never Fritz's dream. So when he graduated high school in 1932,

he made other plans. Packed and ready with a scholarship to launch a football career at the University of Alabama, Fritz was intercepted by his father who pleaded for him to stay and help with the business. With a commitment to family stronger than a desire for football and academics, Fritz's decision was made. He returned to the fish market. Less than a decade later, he founded Liberty Fish Company. In partnership with his four brothers, Fritz built Liberty Fish into a major player in the international seafood industry.<sup>1</sup>

#### FISHING GOES HIGH TECH

When Fritz Goldstein first started working at the fish market in the late 1920s, human capacity to catch fish was limited by communications, transportation, and technology. Fritz recalls one harrowing journey to buy Lake Whitefish from Lac La Biche, one of Alberta, Canada's largest lakes. One way, the trip required eight airplane flights plus a twelve-mile (nineteen-kilometre) trek on a dogsled.<sup>2</sup>

Even when diesel engines largely replaced steam power on fishing boats after the First World War, and fishing efficiency increased markedly, some places were simply too far or too deep to fish. Most fisheries occurred relatively close to shore and consequently, there were natural refuges for fish to hide and reproduce. Deep-dwelling species were impractical targets back then, so by default some naturally vulnerable species such as orange roughy were protected from exploitation. The Second World War and its aftermath, however, not only changed the social and political landscape of the world, but dramatically transformed how and where fishing occurred.

Savvy fishers discovered that by applying naval battle technology to fishing boats, they could radically improve their capacity to catch fish. SONAR, designed to detect enemy submarines,

became an effective fish finding device. RADAR allowed safe operation in dense fog. LORAN permitted pinpoint navigation to fish hide-outs with push-button ease. And with the availability of new synthetic materials like nylon, which did not rot as easily as

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natural fibre nets, fishers could fish longer than before. These technological improvements made it possible for seafood buyers like Fritz Goldstein to introduce new fish to the market. On his first trip to New Zealand, for example, Fritz's customers presented him with the once-elusive orange roughy.<sup>3</sup> Before long, few species remained undiscovered.

### **THE SEAFOOD MARKET GOES GLOBAL**

While seafood markets in coastal communities still feature some locally caught species, most fish markets in the developed countries now thrive on imported seafood. At major trade centres such as New York City's Fulton Fish Market, shouting fishmongers entice chefs and other buyers with a vast assortment of fish, fresh and frozen, live and dead. The world's largest fish market, Tsukiji in Tokyo, Japan, has the most diverse selection. Tautog and summer flounder from the U.S. East Coast, and lobsters from Maine are featured among fish, shellfish, and invertebrates extracted from virtually every fishable body of water on the planet.<sup>4</sup>

As the world's first- and second-largest importers of seafood, Japan and the U.S.A., respectively, are highly influential in determining the global fish catch. Having overexploited many

of their domestic fisheries, the United States and other major importing nations now depend on developing countries to meet their demand. China and Peru report the largest catches of wild fishes, followed by Japan, the U.S.A., Chile, Indonesia, the Russian Federation, and India. The fish trade is big business today. According to the United Nations' Food and Agriculture Organization (FAO), trade in seafood products in 2000 reached US\$55.2 billion.<sup>5</sup> Consequently, when we discuss fisheries and aquaculture in the world today, we must retain a global perspective.

The value of seafood stretches far beyond that of a commodity bought and sold in the world market. Globally, people depend on fish for food and for work. Over one billion people in the world today depend on fish for at least 30 percent of their animal protein intake. And over half of the world's population relies on fish for at least 20 percent of their animal protein. Coastal communities tend to eat more fish than inland communities. And in some small island states, fish is the sole source of animal protein. Furthermore, the FAO estimates that 35 million people worldwide are employed full or part-time in fisheries and aquaculture (seafood farming). The distribution of these workers (Asia, 85 percent; Africa, 7 percent; Europe, South America, and North and Central America, 2 percent each; and Oceania, 0.2 percent) reflects the general population distribution and predominance of labour-intensive economies.<sup>6</sup>

#### THE OCEANS FEEL THE PRESSURE

The global seafood market, as we recognize it today, grew relatively quickly after the Second World War. Global catches of wild species increased rapidly in the 1950s and 1960s as a result of the factors described previously — increased efficiency from improvements in technology, transportation, and communications. According to the FAO, the increases continued, albeit at a

slower rate and with some exceptions, until peaking at 83 million tonnes in 1989. The exceptions were quite significant: in 1972 the world's largest fishery, Peruvian anchoveta, collapsed, partially due to oceanographic conditions related to El Niño. (In the mid-1990s El Niño period, the anchoveta fishery again declined substantially.) In its latest report on the status of world fisheries, the FAO suggested that catches have since recovered to levels seen in the early 1990s, prior to the latest major decline in Peruvian anchoveta: 77–78 million tonnes.

In the 1990s the FAO attributed global total fish-catch increases to production from China. China's reported catches are so high — almost 20 percent of total world production in 1998 — that they significantly affect the global total.<sup>7</sup> Ever since the collapse of the Peruvian anchoveta fishery in the early 1970s, scientists have warned of the upper limits to our oceans' capacity to supply fish. While the FAO has acknowledged that these claims are substantiated,<sup>8</sup> its portrayal of the status of the world's fisheries has been overly optimistic. Collecting statistics on the world's fisheries is clearly challenging. Relying on member countries to provide their own catch reports, the FAO has few safeguards to ensure that its statistics are accurate.

Specifically, there were some indications that China's catch reports were too high. For example, some of China's major fish populations were declared overexploited decades ago. In 2001, Watson and Pauly published an eye-opening study in the journal *Nature* about the true status of our world's fisheries. These researchers used a statistical model to compare China's officially reported catches to those that would be expected, given oceanographic conditions and other factors. They determined that China's actual catches were likely closer to one half their reported levels. The implications of China's over-reporting are dramatic: instead of global catches increasing by 0.33 million tonnes per year since 1988, as reported by the FAO, catches have actually

declined by 0.36 million tonnes per year. And when catches of Peruvian anchoveta, a species whose abundance fluctuates naturally with changing environmental conditions are excluded, the declines for all other species are even more pronounced at 0.66 million tonnes per year.<sup>9</sup> Watson and Pauly's findings showed that fisheries are not, in fact, keeping pace with people's demand for fish. Instead, real catches had been declining since about the early 1990s.

Furthermore, even with high-tech fish-finders, fishing is not as simple as reaching down and catching a tuna by its tail. Many of the pervasive methods for fishing today are indiscriminate: fishers not only catch targeted species, they incidentally catch other species as well. When last estimated, this non-targeted catch, known as "bycatch," added up to 18–40 million tonnes (at least one-quarter of total catches).<sup>10</sup> These days, instead of being discarded dead, more of the non-targeted catch is being ground up and used as fish-meal for aquaculture.<sup>11</sup> But the impact on the ecosystem of killing such an enormous quantity of wildlife is still the same.

Today's high bycatch stems from the transition to fishing with non-selective fishing gear that occurred a half century ago. Traditionally, most tuna, for example, were caught with pole-and-line gear, which usually hooked the big tunas that fishers wanted. Today, however, far fewer fishers employ this method. Instead, fishers use purse seine nets to target yellowfin and skipjack tuna for the canned tuna market. In addition to the high volume of tunas caught, purse seines also catch substantial numbers of billfish, sharks, sea turtles, and marine mammals.<sup>12</sup> And the pelagic longline fishery, targeting the higher-value tunas and swordfish, has among the highest bycatch worldwide. Monofilament or steel longlines can stretch for miles parallel to the sea surface, with as many as 12,000 baited hooks hanging vertically per line.<sup>13</sup> With 100,000 miles (160,000 kilometres) of line and 5 million baited hooks set each day throughout the world's oceans, many other

species are caught in the process of fishing for tunas and swordfish. Sharks are the most substantial bycatch in longline fisheries, causing population declines for many shark species. In the Northwest Atlantic, most shark species caught in pelagic longlines

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are declining.<sup>14</sup> Longline bycatch also includes many juvenile individuals of targeted species as well as billfishes, mammals, seabirds, and endangered sea turtles.<sup>15</sup>

Although longlining is inherently an unselective method of catching tunas and swordfish, with technological ingenuity fisheries can reduce bycatch of some species. Experiments in the U.S. Atlantic, for example, showed that using circle-shaped hooks instead of the typical J-hooks, and mackerel bait instead of squid, reduced bycatch of leatherback and loggerhead sea turtles by 67 percent and 92 percent, respectively. Fishery managers in Hawaii now require that Hawaii-based swordfish boats use this more turtle-friendly gear.<sup>16</sup> Adoption of these methods in longline fisheries in other regions of the world, coupled with protecting sea turtle habitat, reducing illegal hunting of sea turtles for meat, and adhering to fishery regulations that protect turtles in other fisheries, could make a tremendous difference to the world's sea turtle populations.

Shrimp fisheries, using mobile trawls to catch America's favourite seafood, have some of the highest bycatch of all, accounting for over one-third of discards globally when last assessed.<sup>17</sup> Bycatch in shrimp fisheries includes finfish, invertebrates, and sea turtles.<sup>18</sup> In some shrimp fisheries, including the

U.S. South Atlantic and Gulf of Mexico, fishers are reducing overall bycatch using Bycatch Reduction Devices (BRDs) and incidental catches of sea turtles using Turtle Excluder Devices (TEDs). However, despite regulatory efforts to ensure that shrimp imported to the U.S.A. come from turtle-safe fisheries, outside the U.S.A. many shrimp fishers fail to comply with TED regulations. In Central America, for example, weak enforcement allows the majority of fishers to claim they are TED-certified without properly using the turtle escape devices.<sup>19</sup>

#### THE BROADER EFFECTS OF FISHING

Concerned about the broader implications of fishing, scientists increasingly monitor the impacts of fishing on marine communities and ecosystems. In a widely publicized study, Myers and Worm showed that longline catch rates of large predatory fishes today are a mere 10 percent of catch rates at the start of industrial fishing. They infer a 90-percent loss of large predatory fishes from the ocean. Their study marked the first demonstration of declines in whole communities among diverse ecosystems; other analyses have shown declines in single species. Declines occurred rapidly: fishing reduced community biomass by 80 percent in fifteen years.<sup>20</sup>

We do not yet know what the long-term ecosystem effects of removing 90 percent of predators might be. And under the modern fishery management paradigm, regulatory agencies are doing little to stop overexploitation of species before we can find out. Fishery management agencies and commissions usually implement regulatory measures after industrialized fishing has become widespread. Consequently, they're working to stabilize populations at low levels of abundance. This approach may continue to have grave consequences for fishers as they suffer from low economic yields, and also for marine ecosystems in both coastal and oceanic ecosystems.<sup>21</sup>

Scientist Daniel Pauly coined the phrase “Fishing down marine food webs” to describe fishers’ shift from catching large predator fishes to smaller fishes and invertebrates.<sup>22</sup> Later, Pauly et al. analyzed species and their trophic levels (the level in the food web that a species occupies, with algae at a trophic level of one).<sup>23</sup> The research showed that as large fish have been depleted, fishing operations have been shifting their targets down

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the food chain at a rate of 0.5 to 1.0 trophic levels per decade. This demonstrates a worldwide trend in coastal and oceanic fisheries since the early 1950s. Where fisheries are most developed, mostly in northern temperate areas, trophic levels have steadily declined in the last few decades.

The consequences, Pauly et al. state, are significant shifts in the structure of marine food webs.<sup>24</sup> Contrary to some people’s hopes, fishing out the largest fish doesn’t necessarily release the smaller fish from predation. Nor does it offer more fish for humans to catch. Rather, removing the large fish increases the populations of previously suppressed species, such as invertebrates. While markets exist for some invertebrates like squid and jellyfish, other species are toxic. The Groundlings comedy group have produced a short film in which a couple dining in an upscale restaurant of the future orders the catch-of-the-day, only to find that the catch-of-the-day, today and everyday, is a bowl of jellyfish soup because that’s all that’s left.<sup>25</sup>

#### CAN AQUACULTURE KEEP FISH ON OUR PLATES?

Globally, aquaculture, or seafood farming, is already a significant contributor to seafood supply. According to the FAO, aquaculture is the fastest growing of all animal food-producing sectors (9.2 percent per year since 1970 compared to 1.4 percent for capture fisheries and 2.8 percent for terrestrial meat production). And it continues to contribute increasing amounts of fish, crustaceans and molluscs to total global seafood production: from 3.9 percent in 1970 to 27.3 percent in 2000. China has reported the fastest growth. However, the FAO states that China may have over-estimated production in this sector as well.<sup>26</sup>

Proponents of aquaculture suggest that it can lessen our overfishing burden on wild fish populations, and can enhance food supplies. (When asked in 2004 whether he ever imagined that we could catch too many fish, even ninety-year-old Fritz Goldstein replied, “Oh no, because we’re farming fish now.”<sup>27</sup>) Many people still do not know, however, that production of some species is inefficient and unsustainable. Many species farmed today are carnivores dependent on wild-caught fish for feed. Farming carnivores entails a net loss of protein and fails to conserve wild fish populations.<sup>28</sup> In 2001, salmon and shrimp — two of the top four groups under aquaculture worldwide — relied on fishmeal and fish oil for their feed. Presently around 29 percent of world fish production goes to non-food products, most of which is for fish meal and oil.<sup>29</sup>

Even if non-fish-based feeds become more commercially available and viable, aquaculture’s sustainability depends on production methods and the types of inputs and outputs. The general system-design is a good overall proxy for the operation’s effect on the surrounding environment. For example, net pen systems used to raise farmed salmon allow excess feeds and fish faeces to be released directly into open bodies of water. In contrast,

closed tank systems confine wastes, making it easier to control internal and external water quality. Other important factors in determining aquaculture's potentially harmful impacts include: 1) use of pollutants such as pesticides, paraciticides, and antibiotics; 2) the frequency with which species escape from fish farms, and whether escaped species are native or non-native to the farmed areas; 3) the environment's relative ecological sensitivity and whether it is occupied, converted or adversely affected by aquaculture; and 4) the presence and effectiveness of regulations on water quality, pollution, and other effects of aquaculture. Still, some aquaculture operations today are already sustainably producing seafood. Native species of filter-feeding shellfish, when suspended in bags, nets or cages — as opposed to being dredged — are a good example.<sup>30</sup>

## IMPORTANT STEPS FOR RESTORING THE OCEANS TO BALANCE

### Creating a Sustainable Seafood Market

Increasingly, the public is beginning to connect the fish on their plate with an ocean or fish farm where it once swam. Media coverage of overfishing has grown, leading more people to wonder how their favourite fish are faring. We know firsthand that consumers want to know which fish are ocean friendly and which aren't. In response to the public's question, "What's okay to eat?" we published our first guide to seafood in 1998.<sup>31</sup> Today, millions of guides to ocean-friendly seafood are in circulation by us at the Blue Ocean Institute and other organizations such as Environmental Defense and the Monterey Bay Aquarium.

Despite the popularity of consumer-education tools like the seafood guides, many species remain hidden from the general public eye. Most consumers are still not yet aware of what's entailed in bringing their favourite fish to the table, or if the species is healthy or in poor shape. Some of these considerations include: Does a

wild-caught species have natural vulnerabilities to fishing pressure such as late maturation? Is the species abundant or depleted? Is there strong management in place? Is the species caught in ways that don't harm the environment or other creatures?<sup>32</sup>

The sustainable seafood movement has thus far shown that when people learn a species is in poor shape, or that catching or farming it has serious ecological consequences, they want a better option. Once they're aware of what their choices entail, it's unacceptable to eat something on the brink of endangerment. At the same time, consumers who know a fish enjoys healthy levels of abundance, and is sustainably caught or farmed, feel motivated to chose the more ocean- or environmentally friendly option.

In the food world, chefs set the trends. With the help of industry's creative marketing — like renaming Patagonian toothfish “Chilean seabass” to increase its appeal — skilful chefs can lift a fish from relative obscurity to “must-have” status on menus nationwide. A poorly managed species can suffer tremendously from a trend. The Chilean seabass craze increased illegal fishing, and caused a decline of toothfish populations to low levels. Furthermore, large numbers of endangered albatrosses and petrels are hooked and drowned as they try to steal bait from longline vessels targeting toothfish.<sup>33</sup>

Informed chefs, concerned about sustainability, can set new standards for how seafood is selected and promoted. Their culinary prowess can subtly if explicitly guide consumer choices. Chefs can also help provide economic incentives for improved fishery management. In 1998, around the time we published the first consumer guide to ocean-friendly seafood, over 700 top chefs on the U.S. East Coast teamed up with conservation organizations Seaweb, and the National Resources Defense Council, to launch the “Give Swordfish a Break Campaign.” Nationally renowned chefs, including Nora Pouillon from Restaurant Nora (Washington, DC) and Rick Moonen, now of RM Restaurant

(New York), took swordfish off their menus. This prompted the international fishery commission, responsible for managing Atlantic swordfish, to cut catch-quotas, and the U.S.A. to close important juvenile nursery grounds. When the boycott affected

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the price of swordfish, and the management agencies felt enough pressure to implement stronger conservation measures, the boycott was called off.<sup>34</sup>

The campaign was effective — the number of juvenile swordfish has increased.<sup>35</sup> Time, and continued conservation measures, will determine whether swordfish can truly rebound. But the campaign clearly demonstrated that consumers and chefs can powerfully affect fishery decisions and help shift public consciousness. Campaigns for species protection, improved fishery management, and aquaculture reform are currently in effect for toothfish (“Take a Pass on Chilean Seabass”), Caspian Sea Sturgeon (“Caviar Emptor”), and farmed salmon (“Farmed and Dangerous”). These campaigns are undeniably increasing awareness among seafood consumers.

Changing consumer behaviour may require publicly visible events such as boycotts to draw initial attention to an issue. Boycotts can work if they have a tangible goal. Once that goal is met, the boycott ends. Making changes that last, however, requires moving beyond trend-setting, because trends are, by their very nature, ephemeral. The backlash against the anti-fur

movement is good example. In 1989, People for the Ethical Treatment of Animals launched its campaign to dissuade consumers from wearing fur. Disturbing images of wild minks, foxes, rabbits, and other animals killed for fur, and the inhumane conditions at fur farms, persuaded many consumers to respond by boycotting fur coats and other fur garments.<sup>36</sup> Some top fashion models endorsed the campaign and it became unfashionable to wear fur. Industry felt the effects. Throughout the nineties, consumer rejection substantially decreased purchases of pelts and fur garments, so that many trappers and ranchers went out of business. The campaign also affected public policy. Several American states and eighty-five countries banned steel-jaw leghold traps. The United Kingdom, Holland, and Austria have banned farming some selected animals for fur altogether.<sup>37</sup> The fashion industry, however, retaliated with a marketing campaign of its own. In the current fur revival, fashion magazine covers feature some of the models who only a decade ago swore they'd rather be naked than wear fur.<sup>38</sup> Thus, the creation of lasting shifts in consciousness, and subsequently in behaviour, entails something deeper. Lasting change comes from developing personal relationships with the world and the living things around us.

#### **Creating Lasting Change, Inspiring a Sea Ethic**

In his 1949 book, *A Sand County Almanac*, Aldo Leopold articulated a framework for how we might consider our relationship with our environment. His idea: that our sense of community can extend beyond humanity to encompass people as well as the living landscape. His sensibility had a moral component, which he called the Land Ethic. “A thing is right,” he wrote, “when it tends to preserve the integrity, stability, and beauty of the biotic community, and wrong when it tends otherwise.”<sup>39</sup> Right actions safeguard present and future options — not just for people but for the whole living world.

Leopold's Land Ethic includes all forms of life — human and non-human — in our concept of community. It's possible that Leopold's Land Ethic (really a Nature Ethic) excluded the oceans because his own life experience was focused on the Mid-western part of the United States. A more likely reason, however, is that when he formulated his Land Ethic, he — and most of the world — was unaware that the oceans were in trouble. At that time there was little or no documentation of fishery collapses, ocean dumping, coral bleaching, or any of the other crises that have since grown acute. Now, few individuals are truly removed from impacting the oceans. One-third to one-half of the world's population now lives within fifty miles (eighty kilometres) of a coast. Even inlanders consume seafood caught or farmed in the oceans, products shipped across the oceans, or rely on energy sources, like fossil fuels, that indirectly affect the oceans through climate change. Understanding the state of the oceans today tells us that it's time we extend our sense of community below high tide — we need now a Sea Ethic.

How do we begin to see ourselves, the oceans, and the oceans' creatures as part of the same community? Mirroring the way a sense of belonging to a human community is rooted in the personal relationships that individuals have with one another, we can develop a Sea Ethic by cultivating personal connections to the ocean and ocean wildlife. Millions of people now aspire to meet the oceans' creatures on their own turf. They attach tanks to their backs, defying what once were physiological limitations to merge with the sea world. For those who find this interaction too extreme, we bring ocean life to land. We simulate the wild places. Anyone who doubts the impression that visiting an aquarium can make, hasn't seen a child pressing her face to the glass as she witnesses for her first time ever, a shark passing only inches by her nose.

Beginning a relationship with the sea doesn't require that we immediately run off to get sand between our toes. Living in

the modern world, we are already interacting with the ocean in our daily lives. But one way we can honour our relationship with the sea, and become more conscious of how our choices affect ocean life, is by changing our personal approach to selecting seafood. When we peruse a menu or stand before the fish counter at a grocery store, our criteria for selecting seafood can extend

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beyond taste and cost. We can begin thinking about and discussing which seafoods are ocean friendly and which aren't. And with reflection, we create ideas and ideals about our community in the largest sense. In essence, we formulate a Sea Ethic.

### **Ecosystem Management: Thinking Bigger**

In ecological parlance, a “community” is defined by all the organisms — including entire populations of different species — that inhabit a particular area and that have a potential to interact. When we consider both a community and the abiotic (that is, non-living) factors that the community interacts with, we call the combination an “ecosystem.”<sup>40</sup> Today we're interacting with our marine ecosystems on multiple levels — from manipulating abundance of individual species populations to altering climate, which ultimately affects the oceanographic conditions that drive production at the base of marine food webs. Thus, more than ever before, the time is right for an ecosystem-based approach to marine conservation.

Many marine conservationists in North America and the rest of the world hail Ecosystem Management as a framework for

policy making. Ecosystem Management means looking beyond the pervasive single-species approach to the broader implications of fishing. Under the single-species approach, management policies usually address only the total catch of the target species and when, where, and how fishing for that species can occur. Unfortunately, the single-species approach has a poor record. In U.S. waters alone, where there is a formal management structure for fisheries, but most fisheries are managed on a species-by-species basis, the status of 75 percent of species populations is still unknown. Of those that we know enough about, managers have officially declared 36 percent overfished.<sup>41</sup> An ecosystem approach goes beyond single-species management by expanding: 1) the list of stresses on a fish population beyond fishing to include habitat degradation and general environmental quality; 2) our understanding of an ecosystem's response to fishing beyond the effect of fishing mortality on a targeted species to include other components of the ecosystem; and 3) the scope of benefits beyond the economic value of fish to include the non-monetary benefits of ecosystem services and the benefits of other human activities.<sup>42</sup>

Considering fisheries from an ecosystem perspective can help address the challenges of managing species and populations that are inherently unpredictable. Unlike the plants in a productive garden, where you can count exactly how many seeds you've planted and estimate with reasonable confidence how many plants your seeds will yield and where they will grow, fish are intrinsically elusive. They move and they are hidden underwater. You can't count them like seeds from a packet. Fish are subject to a wide range of variables that affect their productivity, including trophic interactions, oceanographic fluctuations, and community interactions. Although fishery scientists have a range of sophisticated tools for assessing and predicting population sizes and productivity, there will always be unknowns, especially as we still

don't *know* how many fish we're actually catching. In addition to the problem of over-reporting discussed earlier, illegal, unregulated, and unreported (IUU) catches are increasing.<sup>43</sup> In the face of all this uncertainty, "managing the ecosystem" is extremely difficult. What we have to do is manage human activity, with an ecosystem perspective.

Conservationists commonly refer to a concept, the "Precautionary Principle," whereby we use resources conservatively today to secure their availability for the future. In the

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developed world, people plan their financial future either by investments or through government programs like social security. In developing countries, people still plan for the future — as we used to do — by having children, as a way to help them when they can no longer work. We can apply the same philosophical principle to our future food sources. By building safety measures into our management methods, we can help ensure that we have fish to eat in the future.

#### **Ocean Zoning: A New Tool in the Ocean Conservation Toolbox**

Ecosystem Management provides resource managers and conservationists with a framework for addressing the wide range of goals people have for using ocean resources. In an increasingly crowded and hungry world, we look to the oceans for many different reasons: aesthetics, conserving biodiversity, extracting

food, relaxation and recreation, or even intensely competitive sports, like the single-handed boat-races around the world. These activities often conflict, creating territorial battles that sometimes erupt in the courtroom and within communities. One ongoing conflict involves recreational and commercial fishers competing over prime fishing grounds. And as society's desires change, new conflicts arise. In Cape Cod, Massachusetts, for example, residents wanting to maintain a particular aesthetic along the coastline are at odds with others who want to place energy-generating windmills in coastal waters. Resolving user-conflicts like these requires managing people and their resource use from an ecosystem perspective.

Tangibly, we can approach Ecosystem Management using tools and techniques we already know and understand. On land, for example, planning starts with assessing a need, surveying the land's capacity to meet the need, and creating blueprints that represent the plan. Many communities manage competing demands on space and resources by creating land-use plans that zone areas as residential, commercial, agricultural, industrial, and recreational. Moving away from our current open-access, free-for-all approach to ocean management, toward a method that utilizes zoning, is a way to handle the competition for ocean resources among the world's growing population. As architects for sustainable seas, we can create blueprints that *plan* for biological, economic, aesthetic, and spiritual needs.

Designing and implementing a zoning strategy requires that the public, marine-resource managers, and policy-makers understand that the ocean is not a blank space between continents, but instead is a diverse environment where some places are biological hotspots, and others vary in their ecological sensitivity. Accounting for this diversity, we can allocate appropriate areas for commercial fishing, aquaculture, shipping, scientific research, and pleasure activities like SCUBA diving, recreational fishing,

and boating. Some areas will be multiple use, some restricted use, and others places will preclude resource extraction of any kind (“no-take” zones). These protected areas can help to increase marine fish production and protect marine ecosystems, and, in turn, help generate food for the future.

Worldwide, we already have several examples of successful government-supported marine zoning initiatives. Australia’s Great Barrier Reef Marine Park is the most famous. Established under the Great Barrier Reef Act of 1975, and further implemented under the Great Barrier Reef Marine Zoning Plan 2003, the Marine Park works to protect biodiversity in all habitat types and maintain and enhance cultural, tourism, and recreational values. Areas are zoned for particular types of fishing (for example, some sections restrict trawling), shipping, and recreational uses.<sup>44</sup>

Following Australia’s lead, other countries have implemented zoning programs. They include Belize’s Marine Reserves at Hol Chan and Glover’s Reef, and the U.S.A.’s Florida Keys National Sanctuary. While the geographic extent of these programs is small relative to our need for a comprehensive ocean management strategy, they provide an important launching point for planning future initiatives. Additionally, the U.S.A. already has various fishing-gear restrictions (no trawling and no longlining in some areas), extraction limits (oil leases), and limits on activities such as jet skiing in certain National Marine Sanctuaries. Still, there is no comprehensive approach to regional planning and management. New technologies such as wind-generators and widespread aquaculture will only further complicate future conflicts unless a zoning discussion gets underway.

We suggest that the time is right to begin formal discussions about ocean zoning. To date, premature conflicts between the conservation and fishing communities over what specific areas would be protected — and how large these areas would be — has

stymied public support for Marine Protected Areas (or “no-take” zones) in the United States. People have failed to understand that no-take zones are only one type of “zone,” albeit an important one in a comprehensive zoning strategy.

Fritz Goldstein smiles softly as he concludes his stories of memorable travels around the world in search of new seafood sources

## **THE TIME IS RIGHT TO BEGIN FORMAL DISCUSSIONS ABOUT OCEAN ZONING.**

and lifelong business partners and friendships. In his palm he holds a tiny, delicately carved figurine of a Vietnamese fisherman pulling his catch from a net. Fish-inspired artwork displayed throughout his apartment is the last remaining relic to his half-century in the seafood business. And so for Fritz, telling his story rekindles feelings of happiness and pride.

Imagination and ambition, enabled by developments in communication, transportation, and technology, led Fritz Goldstein and other well-meaning architects of the modern seafood industry to re-define the perception of the oceans held by the generations before them. The capacity to fish where no-one had gone before transformed their image of the oceans from a blank yet dangerous void between continents to a seemingly inexhaustible source of food and business opportunity. In their eyes, their relationship with the oceans undoubtedly was an improvement from years past.

In the last few decades, our natural curiosity prompted us to further explore our ocean world. In the process, we learned that the ocean is far more alive and intricate than we had ever

imagined. From below the surface, we extracted images of multi-coloured fish staking their territory among vibrant coral reefs, sharks dwelling in deep ocean caves, and migrating giant bluefin tuna chasing their bait at breakneck pace. With this imagery, we triggered human fascination. And people began to care.

We cannot heal the oceans overnight. Pollution, invasive species, habitat destruction, overfishing, aquaculture, coastal development, and climate change are all threatening our oceans today.<sup>45</sup> With inspired imagination, intelligence, motivation, and skill, however, we can reconfigure our current relationship with the seas. Acting from a place of hope, we can restore abundance to the seas.