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### Recommended Citation

Hesse, Stephen T. "Adapting to Sea Change: Managing Marine Resources in the Face of Climate Uncertainties." *Sustainable Development Law & Policy*, Spring 2005, 37-44, 81.

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# ADAPTING TO SEA CHANGE: MANAGING MARINE RESOURCES IN THE FACE OF CLIMATE UNCERTAINTIES

By Stephen T. Hesse\*

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## INTRODUCTION

If Captain Kirk of the Starship Enterprise was right and space is the final frontier, then our oceans and their unexplored trenches and seamounts are a close second. For now though the heavens can wait: in the short-term, preserving our oceans and maintaining successful stewardship of marine resources are far more important to human prosperity. For better or worse, by the middle of this century we will know if we have succeeded, and our success will depend on how quickly, and comprehensively, we respond to the unpredictable climate changes that have already begun to impact our oceans and marine resources.

Many of us have grown up with pictures taken from space that reveal Earth is a sparkling blue planet, dominated by water. Oceans cover more than 70 percent of Earth's surface and plunge as deep as eleven kilometers or 6.8 miles. In 2002, fishermen extracted around 84 million tons of fish from the planet's seas and oceans, and more than 2.6 billion people – half the world's population – received at least twenty percent of their animal protein primarily from marine sources.<sup>1</sup>

In the U.K. no one lives more than 125 kilometers from the sea, eighty percent of Australians live within fifty kilometers of the ocean, and in the U.S. more than half of the population lives in coastal watershed counties. Looking seaward, the U.S. has the largest exclusive economic zone ("EEZ") in the world, extending 200 nautical miles offshore along 13,000 miles of coastline and encompassing 3.4 million square nautical miles of ocean (a square nautical mile equals 1.3 square miles). About one half of the U.S. gross domestic product (\$4.5 trillion in 2000) is generated in coastal areas and adjacent open waters.<sup>2</sup> Considering the importance of the ocean, it is amazing how little we know about our seas. The U.S. Commission on Ocean Policy acknowledged in its Ocean Blueprint that "the oceans remain one of the least explored and most poorly understood environments on the planet." Yet we depend on their riches in countless ways.

The seas provide global transportation routes that link ports worldwide and are the lifelines of coastal economies and inland cities. Our coasts are havens for recreation and tourism, while coastal and offshore fisheries provide jobs and essential protein for food. Coral reefs and unexplored deep waters host abundant

biodiversity that may prove invaluable in the search for pharmaceuticals and new food sources. Scattered across the ocean floor, too, are mineral riches, gas and oil deposits, as well as geothermal resources. The seas offer other sources of energy as well, including waves, tidal action, and temperature differentials that can be harnessed to produce electricity. And some of the most valuable riches that our coastal areas and open waters offer are those that are most difficult to value, including "global climate control, life support, cultural heritage, and the aesthetic value of the ocean with its intrinsic power to relax, rejuvenate, and inspire."<sup>3</sup>

Despite the invaluable role the oceans play in modern society and the unknown riches of their seemingly boundless depths, multiple human threats endanger our seas, including anthropogenic climate changes. This article will offer a brief look at

our oceans, the resources and services they provide, and how we are treating them. It will then consider how climate changes affect these waters and the marine resources that underpin our fisheries and seafood industry, followed by a look at some public assessments of our seas and some private initiatives that are seeking to conserve marine resources. It will also offer some thoughts on how climate

change may provide an incentive for fishing industries, conservationists, the business sector, and governments to cooperate in addressing the critical issues of sustainable development related to marine exploitation and conservation. Perhaps, in doing so, this article will offer an impetus for greater cooperation on other issues related to environment and change.

## HUMAN DEPENDENCE ON MARINE RESOURCES

In the United States alone, more than thirteen million jobs are tied to maritime trade. Annual offshore oil and gas extraction is valued at between \$25 and \$40 billion, and marine-sourced pharmaceuticals and bio-products are part of a growing industry, potentially worth billions of dollars.<sup>4</sup> The most familiar resources we pull from the oceans are fish, but the fish themselves are only part of an economic and cultural tradition that

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*With increasing climate change, we are facing unprecedented changes to our seas.*

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enriches towns and cities of coastal regions worldwide. Fish provide a healthy source of protein, and hundreds of thousands of jobs ranging from fishing to transport to retail. In the U.S., the annual value of the commercial fishing industry exceeds \$28 billion, while recreational saltwater fishing is worth another \$20 billion.<sup>5</sup> The coasts are home to millions of Americans and attract millions more who come for recreation and tourism, one of the fastest growing business sectors in the U.S. and its territories. These visitors spend billions of dollars, providing jobs for millions of workers. For instance, money spent on recreational boating annually tops \$30 billion.<sup>6</sup>

Unfortunately, despite these economic benefits, we do a poor job of assessing and valuing the intrinsic services our oceans and coastal waters provide. We do not appreciate how climate control is regulated through carbon sequestration and how the ocean serves as hatcheries for the fish and shellfish we take for granted.<sup>7</sup> Considering how much coastal communities benefit from tourism dollars and the seaside real estate market, it is surprising that we have not done a better job of putting monetary values on sandy beaches, clean water, and unobstructed ocean views. Far too often, we do not realize the full worth of these natural assets until an oil spill or careless development takes them away from us, and only then do we measure the loss in terms of fish killed or tourism lost.

But accidents and carelessness are not the only causes of marine degradation. Decades of coastal disturbance, resource extraction, waste disposal, and fishing have compromised the biological health of our seas.<sup>8</sup> All along our coasts we continue to construct port infrastructure, resort and recreation facilities, and barriers and jetties to prevent flooding and erosion. These, in combination with dredging for navigation, alter and degrade coastal and riparian ecosystems that are important nurseries for marine life. Offshore we drill for gas and oil, and drag heavy trawling gear along huge swaths of the sea bottom to gather fish and shellfish. These activities degrade the marine environment, stirring up sediment, destroying habitat, and reducing the valuable diversity of life that once thrived on the ocean floor.<sup>9</sup>

In addition to the bounty we have extracted from the oceans, we have assumed that our boundless oceans can take as much abuse as they can provide us benefits. For centuries, we have used our rivers, bays, and oceans as dumps. Relying on the outdated adage, "dilution is the solution to pollution," we continue to use our seas in this manner, even as our wastes have dramatically changed in quantity and quality.<sup>10</sup> What was once an easy way to dispose of sewage and simple garbage remains the default mode worldwide for disposal of human, animal, and

industrial wastes. The magnitude of the problem is amplified as wastes from communities across the globe are finding their way into our oceans through atmospheric emissions, point-source and runoff discharges, as well as direct dumping. These wastes include industrial and agricultural chemicals, oil spills and petroleum products, heavy metals, and radioactive substances.

And from these same waters we pull the fish and shellfish we eat. For human society, global fisheries are some of the most important food resources available, yet we are undermining their survival. The Food and Agriculture Organization of the United Nations ("FAO") estimates that only about one-quarter of monitored ocean fish populations are underexploited (three percent of all ocean fish) or moderately exploited (21 percent of all ocean fish)<sup>11</sup> and could produce more.<sup>12</sup>

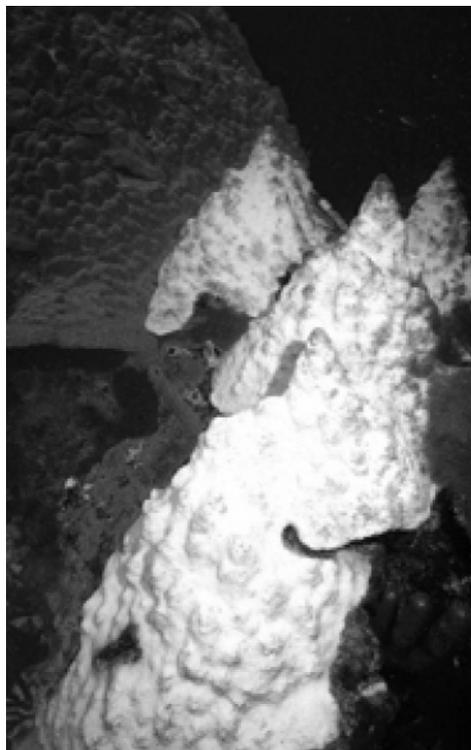
In contrast, 52 percent of fish stocks are fully exploited, producing catches that are close to maximum sustainable limits. Even further, sixteen percent are overexploited, seven percent are depleted, and one percent is recovering from depletion.<sup>13</sup> Conservation is necessary for rejuvenation of these populations.

Of the top ten fish species that provide about 30 percent of the fish we consume, seven of those species are either fully-exploited or over-exploited.<sup>14</sup> Along with over-fishing of target species, by-catch is also a serious problem contributing to

the decline of marine resources worldwide. By-catch refers to the non-target species that are hauled aboard with target species then tossed overboard because they are not commercially valued.<sup>15</sup>

Consciously and unconsciously, we continue to compromise the biological health and productivity of our oceans. Increasingly we understand the impacts of our actions and many communities with political will and financial resources have begun to address some of these problems. But for the most part, we still place great demands on our oceans. These demands are increasing faster than our understanding of the consequences of these actions. Nevertheless, recognizing the critical role oceans play in our food supply and global economy is the first step; the next is to better understand our currently altered seas and then examine how climate changes will impact the oceans and our own use of maritime resources.

Andy Bruckner, National Oceanic and Atmospheric Administration



Coral bleaching is one result of climate change and changing sea temperatures.

## THE REALITY OF CLIMATE CHANGE

For scientists worldwide, there has never been any doubt that climate change is a reality. The essence of most global warming and climate change debates over the past two decades has not been about confirming or denying climate change. Instead, it has focused on determining how much influence

human activities have on our global climate, and in turn on our planetary biosphere.<sup>16</sup>

In 2001, the United Nations' Intergovernmental Panel on Climate Change ("IPCC") offered the most widely accepted and definitive consensus on the issue. The panel announced, "[t]here is new stronger evidence that most of the warming observed over the last [fifty] years is attributable to human activities."<sup>17</sup> Since then, contrarians have criticized the IPCC's conclusions, but the vast majority of scientists agree that today's warming trend is aided by human industrial activity.

More recently, the Arctic Council, an intergovernmental forum comprising the eight arctic nations, released a report detailing the effects climate change is having on our natural resources. The Council's findings are of particular importance to policymakers and scientists. One such conclusion states:

Ice cores and other evidence of climate conditions in the distant past provide evidence that rising atmospheric carbon dioxide levels are associated with rising global temperatures. Human activities, primarily the burning of fossil fuels (coal, oil, and natural gas) and secondarily the clearing of land, have increased the concentration of carbon dioxide, methane, and other heat-trapping ("greenhouse") gases in the atmosphere. Since the start of the industrial revolution, the atmospheric carbon dioxide concentration has increased by about 35% and the global average temperature has risen by about 0.6°C. There is an international scientific consensus that most of the warming observed over the last fifty years is attributable to human activities.<sup>18</sup>

Two months after the release of the Arctic Council's report, a British government report on the state of the U.K.'s coastal waters affirmed the findings of the Arctic report:

Human activity has already resulted in adverse changes to marine life and continues to do so. ... There is also evidence that the marine ecosystem is being altered by climate change: for example sea temperatures are rising and the distribution of plankton species is changing. These changes pose a real threat to the balance and integrity of the marine ecosystem.<sup>19</sup>

Immediately after that report, scientists from Scripps Institution of Oceanography at the University of California at San Diego announced that they had produced clear evidence of ocean warming and confirmed that the warming is primarily the result of human activities.<sup>20</sup> And, just one month later, another group of researchers offered further proof that the oceans are warming and rising. The team of U.S. federal and university scientists at the National Center for Atmospheric Research released a study suggesting that, even if we stop emitting greenhouse gases into the atmosphere, global sea levels will continue to rise eleven centimeters (four inches) by 2100, due to thermal expansion from the warming of the seas as a result of those emissions

we have already released.<sup>21</sup> Some sources argue that we cannot stop our emissions, and so greater sea level rise is inevitable.<sup>22</sup>

## CLIMATE CHANGE AND THE IMPACT ON OUR SEAS

Before considering the impacts of climate change on fisheries, it is worth looking at the potential effects climate change will have on our oceans and coastal areas. Of these, perhaps the easiest to visualize, and the most daunting, is the rise in sea level. Two mechanisms cause ocean levels to rise: thermal expansion and fluctuation of polar ice caps and glaciers, both caused by increases in temperature.<sup>23</sup>

Over the past hundred years, sea levels have been rising about one to two millimeters per year. This is primarily due to thawing following the last ice age. According to the U.S. National Safety Council ("NSC"), this trend will continue unabated due to warming from human emissions of carbon dioxide and other greenhouse gases. As the NSC notes, "the only real disagreement or uncertainty is how high the sea will rise and how fast."<sup>24</sup> Recent computer models estimate that over the next several hundred years sea levels could rise as much as three feet.<sup>25</sup> This could have a devastating effect: with hundreds of millions of people living in low lying and coastal areas, rising seas are certain to endanger human settlements worldwide.

In addition, as oceans warm and rise, storm surges will become an increasing threat to life and property. Storm surges occur when the mean sea-surface height rises during hurricanes and typhoons, causing waves and tides that accompany the storms to become correspondingly higher.<sup>26</sup> Storm surges increase the risk of severe coastal damage and flooding, including flooding along inland rivers. Changing water levels, including flooding and storm surges, will also affect navigation in bays, ports, and tidal rivers, impacting transportation and commerce, and requiring costly changes in navigational infrastructure.

Similarly, a decrease in water levels results in numerous problems. In areas where climate change causes reduced rainfall, water levels in rivers are likely to drop.<sup>27</sup> With less water to dilute pollutants and nutrients, pollution concentrations in coastal areas will rise. Where precipitation decreases, groundwater levels will also drop, and this in combination with rising sea levels will result in greater saltwater intrusion into coastal groundwater supplies. Less river water flow also contributes to warmer waters entering the oceans, further exacerbating the warming of seawater that is already occurring. In other areas, however, where warmer temperatures are causing increased glacial and polar cap melting, the increasing flow of fresh, cold water is likely to cool water temperature and dilute salinity. Since changes in salinity and water temperature also affect ocean water circulation, it is clear that changing climactic conditions will impact oceans and coastal waters in myriad ways that vary dramatically from place to place and from season to season. In short, with increasing climate change, we are facing unprecedented changes to our seas.

## IMPACTS OF CLIMATE CHANGE ON MARINE RESOURCES

Scanning the headlines in the October 2004 issue of *SeaFood Business*, there is no mention of climate change, but it is clear that climate and weather are critical concerns for the fishing industry. Some of the headlines read: “Hurricanes Hammer Florida’s Seafood Industry;” “Red Tides Stifle Bivalve Harvests;” “Crawfish Farmers Need Rain;” and “Hurricanes Miss Red-snapper Fishery.”<sup>28</sup> All too easily, weather can make or break a fishing community, and can determine whether an entire segment of the seafood industry stays afloat or sinks.

Simplifying the big picture, we see that complex and unpredictable feedback loops result when ocean temperatures warm and alter weather patterns.<sup>29</sup> Warming ocean temperatures cause sea levels to rise, but in combination with salinity changes, they also influence the “geographic distribution of marine biota and can have direct effects on the species composition, breeding and population dynamics of plankton, benthos, fish and other species.”<sup>30</sup> In contrast, cold water can affect growth rates, force animals to move to warmer water, and cause species to redistribute.<sup>31</sup>

Coral reefs, for example, are some of the most diverse ecosystems on the planet and are home to more than 25 percent of all marine species. Besides acting as nurseries to young fish and shellfish, they are invaluable for tourism and protect islands and coastal areas from storm surges and pounding waves. In recent years, bleaching incidents, when corals lose their characteristically bright colors, have increased dramatically worldwide and directly correlate with warmer water temperatures.<sup>32</sup> Even a few degrees above-normal water temperatures may cause corals to bleach and die. Corals, which are also highly sensitive to changes in water chemistry, are damaged by any change in chemical composition. For example, rising levels of carbon dioxide (“CO<sub>2</sub>”) in the atmosphere create higher levels of CO<sub>2</sub> in the seas, which in turn reduces the density and calcification rate of corals.<sup>33</sup>

But the impact of warmer water is not just found in shallow waters where corals live. Eight years ago, scientists at the Massachusetts Institute of Technology (“MIT”) reported evidence that “deep-sea environments undergo climatically driven temperature, nutrient and organic carbon flux changes during glacial-interglacial cycles.”<sup>34</sup> Previously it was believed that marine life three kilometers or more below the surface of the oceans was little affected by climactic changes, but this research confirmed that climate changes even affect deep-sea biota.

Since climate changes impact both shallow water corals and deep water benthic life,<sup>35</sup> it is not surprising that ocean fisheries are also affected. For simplicity’s sake, marine fisheries can be divided into coastal and ocean fisheries. Of these, the former will suffer greater impacts from climate change. According to the U.S. Environmental Protection Agency, “[w]etland loss, salinity changes, and higher temperatures are likely to affect fin-fish and shellfish in the coastal zone. The most vulnerable species are those that either reproduce in coastal wetlands, spend their entire lifetimes in an estuary, or both.”<sup>36</sup>

Peter Benchley, the author of *Jaws*, explains in a 2003 film, “In Hot Water,” that the marshy grasslands of tidal estuaries provide food and nursery grounds for hundreds of species. He says in the film, “when the water rises by just a few inches, it drowns the marsh. And when we lose the marsh, we lose the base of the food web.”<sup>37</sup> Furthermore, certain migrating cold water species are also especially susceptible to changes in water temperature. Scientists have found that salmon (including sockeye), steelhead, chum, and coho eat more in warmer waters.<sup>38</sup> However, once temperature reaches a certain threshold the fish can starve to death. If northern Pacific waters warm substantially, the salmon will have to migrate further north or live at greater ocean depths.

High seas fisheries are expected to suffer less impact from climate changes because open-ocean fish are more mobile and less location-dependent. They also regularly experience year-to-year variations in climate. Nevertheless, we are uncertain how temperature changes will affect these fish, and in the meantime human demands on these fisheries are increasing.

As mentioned earlier, many fish stocks are either fully-exploited, over-exploited, or depleted. Looking at tuna stocks, skipjack alone appears to have potential for increased catches, while bigeye and yellow fin are now fully or over-exploited.<sup>39</sup> If, due to warming, the high seas experience substantial changes or fluctuations in temperature, it is unpredictable how these changes will impact the nutrient cycling, food supply, migration patterns, and fertility of fish stocks, particularly the commercial favorites that are already heavily fished.

Aquaculture is beyond the purview of this article, but it is worth noting that worldwide, and particularly in China, efforts to raise freshwater and marine fish species are meeting with considerable success. Aquaculture is expected to play an increasing role in feeding the world’s growing population. Wild fisheries, however, will remain the backbone of subsistence and commercial fishing. Ichiro Nomura, Assistant Director-General of the FAO Fisheries Department recently stated that, “in light of current trends, the continued improvement of management of wild fish stocks is essential. Aquaculture may help reduce pressure on capture fisheries by reducing demand for wild fish and lowering prices, but that’s only part of the solution.”<sup>40</sup>

## HISTORY OF INACTION HIGHLIGHTS THE NEED TO ACT

As Yogi Berra once said, “[w]hen you come to a fork in the road, take it.” There is a growing consensus, symbolized by the international movement to create a Nobel Prize for Sustainability, that we are at a crossroads in human history. Unless we begin to transform the relationship of humans to each other and the environment in a way that acknowledges the interdependence of economic, social, and natural resources, our children and grandchildren will not be able to experience the same quality of life that we have enjoyed. Indeed, they may be facing an unprecedented global crisis if current trends in global warming, water shortages, desertification, and ozone depletion continue.<sup>41</sup>

The two ecosystems where this transformation is most crucial are our forests and our oceans. These troves of biological diversity are the foundation upon which all our needs rest. Oceans sequester carbon and are the “central bank” of the water cycle. They also play a key role in moderating global temperatures and provide food for much of the world’s population. Preserving these oceans and their fisheries is a challenge that must be an integral part of any plan for global sustainability.



The Viedna Glacier in the Patagonia Icefield, Argentina. Global warming causes glaciers to melt, which contributes to rising sea levels.

The freedom to fish on the high seas can be traced to the seventeenth century writings of Grotius and Roman law.<sup>42</sup> Today, the United Nations Convention on the Law of the Sea (“UNCLOS”), which entered into force in 1994, is the cornerstone of the current legal regime regulating the high seas.<sup>43</sup> Article 87 of UNCLOS affirms the principle of “freedom of the high seas,” which includes “freedom of fishing,” but these freedoms have limitations.<sup>44</sup> As noted in Article 87(2), “these freedoms shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas.”<sup>45</sup> Theory and practice, however, depart from this view: “[F]reedom to fish on the high seas combined in most cases with a de facto open access to fishery resources has resulted in a serious and problematic situation, characterized most notably by the lack of incentives for individuals to constrain fishing effort and comply with conservation measures.”<sup>46</sup>

Conservation efforts in the last century have focused primarily on local or regional waters. Until the 1980s, regional fisheries bodies (“RFB”) mainly undertook research and advisory functions, providing a forum for management discussions rather than taking on decision-making and enforcement. Then, the 1982 United Nations (“U.N.”) Convention on the Law of the Sea, followed by the 1992 U.N. Conference on Environment and Development, helped to usher in a new era for RFBs. Since then, the international community has adopted a number of fish-

eries instruments, including the U.N. Fish Stocks Agreement, the FAO Compliance Agreement, and the FAO Code of Conduct for Responsible Fisheries.<sup>47</sup>

For the most part, however, the world’s fisheries remain poorly understood, insufficiently managed, and highly vulnerable to the vagaries of fishers, markets, and ecosystem dynamics, including weather and climate changes. Recognizing there are numerous variables that impact fisheries, as well as diverse local, national, and regional stakeholders with interests in fisheries management, it is obvious that conserving and managing global fish resources for future generations will require a worldwide public and private effort that is cooperative, comprehensive, and fair.

### GOVERNMENT AWARENESS IS GROWING

Two recent reports illustrate that governments have finally begun to appreciate this urgent need to conserve and manage international water bodies. In mid-2004, the U.S. Commission on Ocean Policy released *An Ocean Blueprint for the 21st Century*.<sup>48</sup> Later, in early 2005, the British Government published *Charting Progress: An Integrated Assessment of the State of UK Seas*.<sup>49</sup> Both publications reach similar conclusions about the need for comprehensive cooperation and management.

The U.S. report offers a list of thirteen guiding principles to steer the nation’s marine policy, beginning with sustainability. “Sustainability” is defined as “...meet[ing] the needs of the present generation without compromising the ability of future generations to meet their needs.” The remaining twelve principles are: (1) responsibility for stewardship of the oceans; (2) recognition of “inextricably intertwined” ocean-land-atmosphere connections; (3) ecosystem-based management rather than based on political boundaries; (4) multiple use management “that balances competing uses while preserving and protecting the overall integrity of the ocean and coastal environments;” (5) preservation of marine biodiversity; (6) decision-making based on the best available science and information; (7) adaptive management; (8) understandable laws and clear decisions “governing uses of ocean and coastal resources;” (9) participatory governance ensuring widespread participation of citizens; (10) timeliness and predictability of ocean governance systems; (11) accountability of decision makers and the public; and (12) international responsibility to act “cooperatively with other nations in developing and implementing international ocean policy.”<sup>50</sup>

The U.K. report suggests seven “Actions” to take in dealing with ocean management, and these are divided into two categories.<sup>51</sup> The first category is “knowledge of the marine ecosystem” and calls for: (1) the development of marine ecosystem indicators; (2) “marine monitoring activities, to identify gaps and to develop a more comprehensive approach to U.K. Marine Monitoring;” and (3) “the promotion of marine research into the more fundamental gaps in basic knowledge.”<sup>52</sup>

The second category raises four “institutional issues,” including: (1) “pooling scientific expertise and ensuring that the

relationship of work on specific issues to the broader marine environment is properly understood;” (2) establishing “a national framework for managing marine data and information based on the principle of ‘capture once and use many times’;” (3) developing “a better understanding of how climate change affects the marine environment;” and (4) adopting a proposed Marine Bill “to facilitate the application of ecosystem approach to sustainable development.”<sup>53</sup> The U.K. report also calls for “achieving a fuller and more comprehensive understanding of the state of the seas and so of improving the quality of marine stewardship. All actions will require a coordinated, multi-sector approach to fulfill the vision we have for the marine ecosystem.”<sup>54</sup>

While the U.S. Blueprint focuses more on guiding policy-making and the U.K. report more on acquisition and effective use of knowledge, the two reports stress the importance of sustainability and share three key means of achieving this goal. Both recognize the need for an ecosystem-based approach to sustainable development and the use of marine resources; both state the need for stewardship as a goal in managing these resources; and both identify atmospheric issues as a concern. However, the British call for “a better understanding of how climate change affects the marine environment,” whereas the U.S. report states that marine policies should be based on the fact that “oceans, land, and atmosphere are inextricably intertwined and that actions that affect one Earth system component are likely to affect another.”

### **PRIVATE INITIATIVES TO CONSERVE FISHERIES ARE MAKING GAINS**

The U.S. and U.K. reports illustrate a growing national government awareness of the need for broad-based stewardship and management in order to ensure sustainable marine resources. However, the two representative governments still lag behind the private sector in practical and innovative efforts to conserve fisheries.

#### **ECO-LABELING**

One private sector initiative that is both encouraging better management and successfully raising consumer awareness is “eco-labeling,” such as that being undertaken by the Marine Stewardship Council (“MSC”). MSC is a not-for-profit, non-government organization that certifies fisheries as well managed and sustainable.<sup>55</sup>

The process begins with a request for certification. Then an MSC team takes a comprehensive look at that fishery and determines whether it is well-managed. If the fishery passes certification, products from that fishery can be sold with the MSC logo. As of March 2005, MSC certified eleven fisheries around the world and more than four percent of the world’s wild fish supply was in the MSC assessment process. There are now over 220 marine products stamped with the MSC eco-label in 22 countries.<sup>56</sup>

#### **ECOSOUND PROJECT**

Another interesting initiative in the private sector is the partnership between the New England Aquarium in Boston (the “Aquarium”) and Ahold USA, the fifth largest grocery chain in the United States. The partnership, called the EcoSound Project, was created through a cooperative agreement between the Aquarium and Ahold, in which the Aquarium helps Ahold buy seafood from environmentally responsible sources.<sup>57</sup>

This innovative and unique partnership between conservationists and the seafood industry was made possible through mutual cooperation and understanding about each partner’s

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*Changing water levels, including flooding and storm surges, will also affect navigation in bays, ports, and tidal rivers, impacting transportation and commerce...*

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goals. Ahold USA is a subsidiary of Europe-based Royal Ahold and is the parent company of six supermarket chains with 1,600 stores across the U.S. serving twenty million customers.<sup>58</sup> In 2000, Ahold approached the Aquarium, because its staff had a record of successfully bringing together fisheries stakeholders. “The Aquarium was involved in marine conservation, but was not seen as an environmental advocacy organization that could not work with fishermen. Ahold approached us with this idea of auditing their seafood species,” explained Heather Tausig, Director of Conservation for Global Marine Programs at the Aquarium.<sup>59</sup>

The project was not a simple feat. As Tausig recalls, “traceability was a big issue...trying to find out where their seafood was coming from, and increasing accountability. This was the beginning of the seafood choices movement, and consumers were starting to come to fish counters and ask questions.” Each recommendation by the EcoSound team begins with a look at Ahold’s present sources. The Aquarium researchers then survey scientific literature, talk with scientists, and make site visits. They also look at the history and population dynamics of the species, any fishery management plans, levels of by-catch (unwanted fish that are caught and often dumped), habitat

impacts of fishing, and social and public concerns relating to the fishery.<sup>60</sup>

The research takes considerable time, but Tausig feels that the work is helping to encourage sustainable stewardship of ocean resources, stating that “EcoSound is building powerful incentives for sustainable fishing, rewarding progressive action on the part of business and industry, and encouraging consumers to make purchasing decisions that favor marine conservation.”<sup>61</sup> The project is looking to expand with the Aquarium and Ahold USA beginning to strategize how to expand to other restaurants, food service providers, specialty food stores, and supermarket chains.<sup>62</sup>

Increasingly, corporations such as Ahold recognize that effective conservation policies are still nascent and are concerned that fish stocks are being exploited at increasing rates. Aware that climate changes will make the situation even more complex, forward-looking seafood industry executives are moving proactively to protect and promote management of fish stocks for the sake of future generations of consumers and fishers, both commercial and subsistence.<sup>63</sup>

### **CONCLUSION: WORTH DOING IT BADLY, TO DO IT BETTER**

Recalling three key points from the U.S. and U.K. reports – ecosystem-based marine management, responsible marine stewardship, and better understanding of the effects of climate change – and considering these in combination with the MSC and EcoSound initiatives, potential paradigms can be imagined that orchestrate cooperation among the four key players: fisheries, conservationists, the business sector, and government. Imagining, of course, is far easier than doing.

The goal of such a paradigm would be to ensure sustainable management of fisheries worldwide. It requires successful coordination of local, national, and international environmental regulation on a scope only achieved with the adoption and implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer. Nonetheless, we now see fishermen working with MSC, and Boston Aquarium conservationists working with corporate officers at Ahold USA. The remaining link needed to complete this theoretical circle of stakeholders is the participation of public officials.

Cooperation of this sort was pondered last autumn in *Seafood Business*. K. Dun Gifford wrote an article entitled *Some Good Things are Starting to Happen*, in which he states:

[i]magine that open-ocean fisheries were managed wisely by officials who were knowledgeable about fish, fishermen, fisheries business and environmental considerations. If this dream turned to reality, some truly wonderful things would happen:

- Oceans would be fished and farmed to protect long-term production, not to generate the highest short-term cash flow.

- Market prices for catches would rise and fall within a predictable and profitable range, which would reward fairly the boat owners’ investments and crews’ labor.
- Fishing families would earn stable, year-round wages, and their coastal communities would thrive on these fishing wages and income generated by supporting businesses.
- Consumers would have stable supplies of high-quality local seafood.
- An armistice would end the debilitating wars between fishermen and environmentalists; government regulators would make quick realistic decisions; and court dockets would be empty of head-of-the-pin fisheries cases.<sup>64</sup>

Gilford also asks whether this dream is too utopian. Perhaps it is. But with human population growing, seafood consumption increasing (and over fifty percent of our fisheries already fully- or over-exploited), sea levels rising, and unpredictable changes in climate and weather already influencing human settlements and activities, we are approaching a confluence of human and environmental factors that demand action.

To stabilize marine resources and resource use at a sustainable level, and maintain that level into the foreseeable future, our response to this confluence will require unprecedented cooperation between fisheries, environmentalists, industry, and government regulators. Still, the U.S. and U.K. reports illustrate government recognition that public welfare demands more knowledgeable and comprehensive ecosystem management and biodiversity preservation. If the public sector moves forward with a commitment to fulfilling this demand, and initiatives in the private sector continue to succeed, and if the impacts of climate change further inspire progress in both these areas, the result could be a perfect storm of positive feedback spurring cooperation among key stakeholders for reasons of enlightened self-interest, or simply fear and desperation.

Whatever the reasons for potential cooperation, one obvious downside is that international cooperation requiring transparency, accountability, and participatory governance on such a global scale has never been attempted, and myriad obstacles will ensure that efforts repeatedly stumble. The upside is that, considering what is at stake, even the most halting successes could provide the incentive for redoubled cooperation and further experimentation. And if cooperation among producers, conservationists, industry, and government officials at the local, regional, and international levels can achieve some measurable success in buffering marine resources from human and climate change impacts, what planetary challenge of environmental concern would remain too daunting for this unwieldy alliance to tackle? Certainly, the survival of our second to last frontier demands that we try it. After all, as the author G.K.Chesterton once exhorted, “If it’s worth doing, it’s worth doing badly.”



# ENDNOTES: Adapting to Sea Change

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- <sup>4</sup> Carl Safina and Sarah Chasis, Issues in Science and Technology Online, *Saving the Oceans*, available at <http://www.issues.org/issues/21.1/safina.htm> (last visited Apr. 14, 2005).
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- <sup>10</sup> Bob Shavelson, Cook Inlet Keeper organization, Testimony before the U.S. Commission on Ocean Policy, Aug. 22, 2002, Anchorage, AK, available at [http://www.oceancommission.gov/publiccomment/alaskacomment/shavelson\\_comment.pdf](http://www.oceancommission.gov/publiccomment/alaskacomment/shavelson_comment.pdf) (last visited Apr. 14, 2005).
- <sup>11</sup> SOFIA, *supra* note 1.
- <sup>12</sup> SOFIA, *supra* note 1.
- <sup>13</sup> SOFIA, *supra* note 1.
- <sup>14</sup> SOFIA, *supra* note 1.
- <sup>15</sup> SOFIA, *supra* note 1.
- <sup>16</sup> For more information, see the Pew Center on Global Climate Change, at <http://www.pewclimate.org> (last visited Apr. 14, 2005).
- <sup>17</sup> INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2001: SYNTHESIS REPORT, SUMMARY FOR POLICY MAKERS (2001), available at <http://www.ipcc.ch/pub/un/syrenng/spm> (last visited Apr. 10, 2005).
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- <sup>26</sup> See Windows to the Universe website, University of Michigan, at <http://windows.ucar.edu/tour/link=/earth/Atmosphere/hurricane/surge.html> (last visited Apr. 14, 2005).
- <sup>27</sup> See, e.g., UNION OF CONCERNED SCIENTISTS, CONFRONTING CLIMATE CHANGE IN THE GULF COAST REGION, available at [http://www.ucsusa.org/global\\_environment/global\\_warming/page.cfm?pageID=973](http://www.ucsusa.org/global_environment/global_warming/page.cfm?pageID=973) (last visited Apr. 14, 2005).
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- <sup>30</sup> DEFRA, *supra* note 10.
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- <sup>44</sup> *Id.*

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**ENDNOTES: ADAPTING TO SEA CHANGE** *Continued from page 44*

<sup>45</sup> *Id.*

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<sup>47</sup> United Nations Fish Stocks Agreement 1995, *available at* [http://www.un.org/Depts/los/convention\\_agreements/convention\\_overview\\_fish\\_stocks.htm](http://www.un.org/Depts/los/convention_agreements/convention_overview_fish_stocks.htm) (last visited Apr. 14, 2005); FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, *available at* <http://www.fao.org/legal/treaties/012t-e.htm> (last visited Apr. 14, 2005); FAO Code of Conduct for Responsible Fisheries, *available at* <http://www.fao.org/fi/agreements/codecond/codecon.asp> (last visited Apr. 14, 2005).

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<sup>50</sup> *Ocean Blueprint, supra* note 2.

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<sup>52</sup> DEFRA, *supra* note 10.

<sup>53</sup> DEFRA, *supra* note 10.

<sup>54</sup> DEFRA, *supra* note 10.

<sup>55</sup> *See* Marine Stewardship Council website, at <http://www.msc.org> (last visited Apr. 14, 2005).

<sup>56</sup> Marine Stewardship Council website, *Fisheries*, at [http://www.msc.org/html/content\\_463.htm](http://www.msc.org/html/content_463.htm) (last visited Apr. 10, 2005) (citing Marine Stewardship Council, FISH 4 THOUGHT (Nov. 2004)).

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<sup>62</sup> *Id.*

<sup>63</sup> *Id.*

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