CHAPTER 12

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HOW DO WE PRODUCE FISH SUSTAINABLY?

FINDINGS AND RECOMMENDATIONS

World fish stocks—and world fishing—face an uncertain future. Globally, fishing has never been a more important source of human nutrition nor a greater source of livelihoods and national income. But neither have fish stocks been more threatened nor the global fishing enterprise been in greater flux. Stock assessments, ecological studies, and commercial harvest data tell us that the fisheries crisis is real and global in scope. Harvests from capture fishing have peaked and only growth in aquaculture keeps overall fish production from declining. Larger fleets and more robust technology—as per today's trends—have the opportunity to either hasten the current fisheries decline or increase the efficiency of the fish harvest and lead the way toward sustainable fisheries management.

Achieving sustainable fishing practices and healthy fish stocks will not be easy. It will require action at many levels: changes in national economic development plans and structural government reforms; changes in how fishing rights are allocated to both small-scale fishers and industrial fleets; changes in international cooperation and international trade negotiations; and better compliance with international norms. It will also require a more concerted effort by nations to address the management and monitoring of small-scale and inland fisheries sectors, which are largely unregulated and ignored today.

The fishing sector is far too important to allow its continued downward spiral through inaction, particularly when some initial steps toward sustainability are possible today. These include employing fishing practices that reduce bycatch and waste, adopting policies that emphasize ecosystems, eliminating

damaging subsidies, reducing fleet size, and expanding markets for sustainably harvested fish. These and similar actions are crucial steps on the road to sustainability. In turn, sustainability equates to recovered fish stocks and a fishing industry that can both survive economically and continue to make important social and nutritional contributions to national development.

Below we list some principal findings from Chapters 1-11, and recommend priority actions that governments, fishers, and consumers can take in response.

Findings and Recommendations

1. Ecosystems are Key

What We Know: *Current inappropriate fishing practices don't just deplete stocks, they often significantly alter the ecosystems that sustain them. Conventional management approaches have focused on managing individual stocks rather than maintaining the health of marine and freshwater ecosystems—the basis for current and future production.*

The harm that fishing can cause to targeted fish species is substantial, but the damage does not end there. Bycatch and discards spread fishing's impacts widely among other species and ecosystems. Physical damage from trawling disturbs sea-bottom communities and crucial fish habitat, and the introduction of non-native commercial fish species into freshwater lakes and rivers displaces and threatens native species. Together, this sums to major ecosystem change and impact—impact so severe that it has put in jeopardy the very resource base the fishing community depends on. Only recently have governments officially recognized the breadth of the problem, and realized the necessity to look beyond individual fish stocks as they manage the fishing enterprise.

What We Need to Do: *Reorient fisheries management to account for ecosystem interactions and damages, and make sustaining the vitality of marine and freshwater ecosystems a primary goal.*

The idea of an ecosystem approach to fisheries management has been gaining ground slowly, promoted by FAO and accepted by many at a theoretical level. At its heart, it calls for limiting fishing's impact on ecosystems as much as possible and sustaining the ecological relationships between the species being fished and other ecosystem inhabitants. Unfortunately, progress in incorporating an ecosystem perspective into management measures is challenging. The principles of the ecosystem approach to fisheries management need to be further elaborated into concrete goals and measures that can be applied to daily fishing operations and management decisions. While some steps and priority actions listed below are currently being implemented to some degree, progress is still needed.

Priority Actions:

- ***Shift the focus*** of management approaches and fisheries research from managing single species or single stocks to managing many interacting species and the habitats they require.

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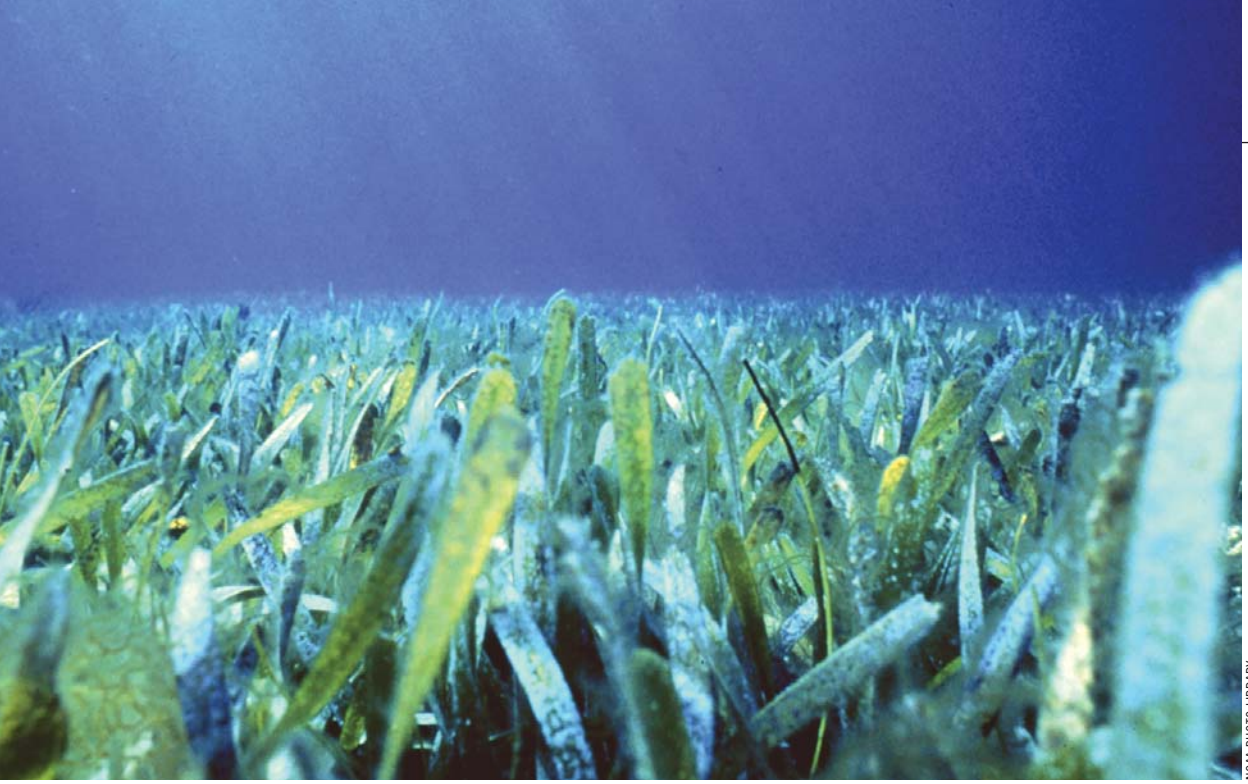
Kelp forests are important habitats for fish and other animals.

- ***Gather data*** specifically on ecosystem impacts of fishing, such as bycatch, disruption of aquatic community interactions, and habitat destruction, as well as the impact of other human activities on the fishing environment, such as water withdrawals, dam construction, pollution, and coastal development.
- ***Create incentives*** to minimize discards and other ecosystem impacts through discard bans, certification schemes, and other practices that create greater access to markets for sustainably harvested fish.



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Healthy seagrass beds form important nursery and breeding habitats for fish.

- ***Strengthen compliance*** with agreed-upon national and international fishing norms and regulations (e.g., strengthened observer programs by placing independent observers on fishing vessels to increase compliance).
- ***Take a regional and international approach*** to managing straddling stocks and migratory species. Fish that cross from one country's waters to another or transit the high seas require the combined management efforts of many countries.
- ***Pursue research*** on management approaches that will enhance an ecosystem approach, such as the use of marine reserves to help restore and maintain depleted stocks.
- ***Build capacity*** and provide support so that these priority actions can be adopted and implemented in developing countries.

2. The FAO Code of Conduct Must Be Applied

What We Know: *The FAO Code of Conduct for Responsible Fisheries has become well accepted at the broad conceptual level, but implementation is still in its infancy in most nations.*

The FAO Code of Conduct provides the key principles for sustainable fishing. It has become the international standard in this area, formally accepted by more than 150 countries since its introduction in 1995. But the Code is an entirely voluntary measure. FAO, as its steward and author, acts as a consultant and promoter of the Code's practices and approaches, but has no authority for enforcement at the national level. Its success depends entirely on national governments and their willingness to implement and enforce national legislation adapted to reflect the Code's guiding principles. Many nations have begun to take heed of these guidelines and principles, putting in place hundreds of management plans tailored to various fisheries. Nonetheless, the Code's potential has been far from realized to date, in part because nations have adopted its guidelines in a piecemeal fashion. In many cases, countries have not fully amended their fishery laws and management practices to conform with the Code, or, if they have, these laws are not yet totally implemented. The net result has been modest change, rather than the more far-reaching reorientation of fishery approaches needed to make fishing sustainable.

What We Need to Do: *Adapt national fishery laws to embody the concepts and provisions of the Code of Conduct and elaborate these laws into concrete fishing regulations and research agendas. Monitor and report on the progress of nations to implement the Code in order to bring public pressure to affect change.*

Priority Actions:

- ***Create incentives and support mechanisms*** for countries to truly implement and enforce the recommendations and principles set forth in the Code of Conduct and associated International Plans of Action (IPOAs), particularly in the developing world, where resources are limited.

- *Provide support* to developing countries so that the principles of sustainable fisheries management are integrated into their economic development and poverty reduction strategies.
- *Encourage objective* oversight and evaluation mechanisms—whether by NGOs and other civil society organizations, or international bodies—to increase transparency in fisheries reporting and promote government accountability regarding how nations have:
  - Adapted the Code of Conduct and IPOAs into national law;
  - Reflected these laws in national regulations;
  - Implemented and enforced these regulations.

Small-scale and inland fishing are far more significant than most people realize, but the importance of these sectors to rural livelihoods has been greatly underestimated and neglected by policy-makers for decades. Instead, management attention and funding has been largely devoted to address issues concerning large commercial fleets.

3. Small-Scale Fishing is Overlooked

What We Know: *Small-scale fishing is far more significant than most people realize, but this sector has been neglected for years by policy-makers who have devoted management attention and funding to larger commercial fleets.*

Small-scale and artisanal fishing is, in terms of the number of people involved, the dominant fishing sector at the global level. It is particularly important as a source of livelihood for the poor, and in developing nations may contribute more to the national economy than industrial fishing. This sector is also the most diverse, and the least monitored and regulated. The lack of attention that small-scale fishers have received puts them at a disadvantage relative to industrial fleets, and leaves the inshore waters and freshwater bodies they frequent inadequately managed. It also leaves small-scale fisheries subject to conflicts between large- and small-scale fishers, and even between the fishing sector and other sectors such as agriculture.

What We Need to Do: *Focus greater management attention on small-scale fishing, and target specific policies and assistance programs at the sector.*

Greater attention at the national level can help small-scale fishers retain control of, and better manage their local resources, thereby safeguarding a crucial source of rural livelihoods. Policies should be aimed at developing management programs that involve fishing communities in the decision-making process. This will include policies to reduce conflicts with industrial fishers and with other economic sectors (e.g., tourism, agriculture); programs that improve monitoring and assessment of the sector so that it can be better integrated with the national economy; plans oriented to develop gears and technologies that are appropriate to local conditions and customs; and regulations that open local and regional markets to small-scale fishers.

Priority Actions:

- ***Promote co-management*** programs that devolve control over certain fishing grounds to local fishing communities. Such management can take advantage of indigenous and traditional knowledge and give local people a stake in maintaining the resource. The authority that is devolved should be well-defined and legally recognized, and should include the responsibility to harvest sustainably. Local control must also be integrated into the wider coastal management regime and coordinated with industrial fishing and other development activities.
- ***Support local control*** with technical and management help at the state level. State support should look beyond the fishing sector. Integrated programs that support fishing along with other rural employment options and social services may be more effective.
- ***Take advantage of traditional knowledge*** and customary management techniques that have been successfully adapted to particular stocks or local conditions.
- ***Support alternative economic development paths*** for fishing communities and prevent and reduce overcapacity in the sector.

4. Inland Fisheries are Underestimated

What We Know: *The importance of inland fishing to rural livelihoods in many developing countries has been greatly underestimated for decades. Habitat degradation is threatening the capacity of freshwater systems to support wild fish stocks in almost all regions of the world. Increasing conflict over water resources is exacerbating the already stressed freshwater ecosystems, putting inland fisheries and the livelihoods of the millions of people dependent on them at risk.*

Inland fishing, which is primarily small-scale, is a significant component of global fish production. It is particularly important to the national economy

and food security of many developing countries, especially in Asia and Africa. Because this sector is largely underappreciated, it is all but forgotten when decisions over water resources are made. As a result, dam construction, irrigation diversions, and other water uses tend to take precedence over inland fishery resources and have impacted the capture fisheries to such an extent that many are only maintained through fish stocking and other enhancements.

What We Need to Do: *Encourage a more integrated river basin approach to water management that takes inland fishing and the maintenance of ecosystem functions into account.*

Integrated River Basin Management (IRBM) refers to an ecosystem approach to managing rivers, lakes, and wetlands. The concept has been largely recognized as the most appropriate way to manage inland water bodies in a sustainable manner. In practice, however, inland fishery resources are often overlooked when assessing river basin development plans. An integrated or ecosystem approach to water resources management requires allocating water in a more balanced way between the ecosystem and other uses such as hydroelectric power production or irrigation. To achieve this, greater monitoring and data collection on inland fishery resources will be needed, both to highlight the importance of the sector and its link to human well-being, and to set realistic water allocations at the basin scale.

Priority Actions:

- ***Establish functional institutional structures***—such as river basin management authorities—that manage water basins in their entirety, and with the participation of all interested stakeholders.
- ***Emphasize the importance of maintaining healthy river ecosystems*** and their fisheries and strengthen the mandate of river basin authorities to incorporate social, economic, and ecosystem considerations into river basin planning.
- ***Integrate inland fisheries*** in river basin development plans by ensuring that water is allocated in a more balanced way between the ecosystem (e.g., water to sustain fish communities and ecological functions) and other sectors (e.g., agriculture, hydropower generation, tourism).
- ***Increase reporting and assessment*** of inland fisheries and the level of dependence of local communities on these resources. Reporting of catch statistics should be at the species level, and ideally catch data should be collected and reported at the basin level, in order to incorporate this information into basin-wide management plans.
- ***Improve capacity to assess the condition of aquatic ecosystems***. Because the major threat to inland fisheries is environmental degradation, information on land-use change, water quality, water withdrawals, and species introductions is critical for assessing the current and future condition of a particular fishery.
- ***Compile information*** on recreational fisheries and fishery enhancements, especially stocking and introduction programs that can be incorporated in a systematic way into fisheries statistics. The consequences of enhancement practices should also be assessed more closely to ensure that the integrity of the ecosystem and its capacity to provide other goods and services is maintained.

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It is essential to provide alternative economic development paths to fishing communities and integrate the communities needs into poverty reduction strategies.

5. Aquaculture Cannot Save Wild Fish Stocks But Can Feed More People

What We Know: *Aquaculture is the fastest growing food production sector in the world, producing nearly 40 percent of the world's total food fish supply. It has become so by expanding, diversifying, and intensifying its operations. But the heavy dependence of intensive systems on human inputs—water, energy, chemicals—and on wild fish for feed and seed, as well as the effects on ecosystems and species are major constraints to the sustainability and future growth of this industry.*

Although much of the world's aquaculture production comes from small- and medium-scale operations, the tendency is toward intensification and higher reliance on fishmeal made from wild fish. In addition, wild juvenile fish are still extensively used in aquaculture as seed fish. These juveniles are largely unaccounted for in capture statistics, and are therefore not taken into consideration in management decisions, such as setting catch limits or making stock assessments. Furthermore, the last few years have seen an unprecedented trend in the transfer of wild-caught juvenile fish, especially high-valued tunas, to open-ocean pens for fattening without these individuals being reported as part of the catch. This practice can seriously hinder stock assessment and misinform the setting of harvest quotas, with grave consequences for some already-depleted wild stocks.

What We Need to Do: *Support and encourage more sustainable aquaculture practices, and streamline the monitoring and reporting of new sea-farming methods in order to avoid negative impacts on wild stocks.*

In recent years, some aquaculture practices, particularly in developed countries, have made considerable progress in increasing production and improving their efficiency. For instance, many salmon aquaculture operations have made substantial reductions in water use and waste generation, and have improved protein conversion rates from fishmeal. However, most operations still have a long way to go to reach the environmental standards being set by numerous national authorities and international aquaculture associations. Regulatory structures need to progress in parallel with rapidly developing technological advances before widespread adoption takes place.

Priority Actions:

- ***Support research*** that focuses on alternative protein sources to manufacture fish feed and reduces the heavy dependence on other human inputs—water, energy, and chemicals.
- ***Invest in research*** to improve small-scale or rural aquaculture while discouraging unnecessary intensification of practices, such as wasteful use of fishmeal.
- ***Promote practices and recent technological advancements*** that lessen the environmental impacts of aquaculture operations and increase their efficiency. Special focus should be placed on facilitating technology transfer and supporting capacity building in developing countries.
- ***Provide market incentives*** for consumers including commercial fish purchasers, such as certification for sustainably farmed products and proper labeling of aquaculture products.
- ***Enforce reporting*** of wild-caught juveniles for sea-farming operations so that management decisions take these individuals into account when assessing stocks and setting harvest quotas. Variables to be reported include: the number of fish transferred, the dates and names of the vessels involved, the location where the fish were caught, the name of the sea-farming facility operators, and the country of ownership of the operation.
- ***National governments should adopt and enforce legislation*** that requires appropriate documentation for the import and export of "fattened" tuna products.

6. Fisheries Data are Poor, Management Uncertainty is High

What We Know: *Lack of sufficient data on the real status of fish stocks, their response to fishing pressure, or the impact of fishing pressure on ecosystems and other species, is a significant obstacle limiting the effective management of fisheries. As a result, scientific uncertainty about what are the correct levels for fishing quotas, and how to design appropriate management plans is high.*

Fisheries data and our understanding of fisheries science is slowly improving, but is still far from adequate to manage stocks with any precision, or to account for the complex workings of aquatic ecosystems and their relation to fish production. Even our knowledge of the status of the most commercially important stocks is fragmented, and often disputed among fisheries biologists and fishers. Our understanding of tropical and inland water fisheries, where many different species may be harvested at once using a single gear type, is especially poor. Yet, in spite of this dearth of information, fisheries managers continue to manage stocks for the highest possible yield, leaving little margin for error if their estimates are incorrect—a strategy that has aggravated the effects of overfishing.

What We Need to Do: *Base fisheries management on sound science and data. Follow the precautionary approach when fisheries data and forecasts are highly uncertain. Greatly improve collection, analytic capacity, and sharing of information, particularly in developing countries. Refine and improve fisheries models and knowledge of fisheries biology to increase the reliability of stock assessments. Improve the communication of scientific information so that it can directly inform policy decisions.*

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Creating incentives for fishers to accurately report their catch and discards is essential for managing fisheries sustainably.

The need for better data is an often-cited complaint, and one that requires persistent and collaborative efforts to address. Nonetheless, poor science and lack of data should never become an excuse for inaction or a reason to disregard caution. More investment in primary data collection and research are clearly needed, especially in the developing world. FAO member countries have recognized this need, and in 2003 adopted the FAO *Strategy for Improving Information on Status and Trends of Capture Fisheries*, which is a framework, strategy, and plan of action to improve the knowledge base and increase and understanding of fishery status and trends (FAO 2003e). The strategy emphasizes small-scale and multi-species fisheries—including inland fisheries—and the need for capacity building in developing countries.

Improved communication of fisheries data and analyses is essential, especially as it increases the understanding of fisheries issues by those outside the circle of professional fisheries managers—the politicians, businesses, and public who may exert substantial influence on fishery policy. In addition, fisheries managers must begin to take the precautionary approach as their guiding principle in situations where data are poor, opting for conservative quotas and tighter harvest controls unless more liberal measures can be soundly justified.

Priority Actions:

- ***Implement the FAO Strategy*** for Improving Information on Status and Trends of Capture Fisheries.
- ***Increase data collection and research*** in key areas, including: small-scale and inland fisheries; impacts of fishing on ecosystem structure and on aquatic habitats and species, especially deep-sea environments and sea-bottom habitats; managing mixed-species fisheries; and understanding the effects of non-fisheries policies—such as trade and subsidies—on global fisheries.
- ***Create incentives for fishers*** to accurately report their catch and discards. At the government level, encourage more systematic and timely data collection and regular monitoring of catch, as well as obtaining additional information on the environmental impacts of fishing practices.
- ***Increase capacity in developing countries*** to improve data collection, reporting, and analysis of important stocks, focusing on those fisheries with the greatest information deficiencies.
- ***Compile and assimilate*** existing data in digital format, in order to increase its accessibility and dissemination.
- ***Encourage analysis*** and presentation of fisheries information in a more policy-relevant and user-friendly format, so that it can inform non-fishery policies such as trade, development assistance, and environmental conservation.
- ***Insist on using the precautionary approach***, especially in data-deficient situations and for mixed-species fisheries. This means:
  - Making more effective use of the best available science while taking uncertainties into account, in order to optimize output rather than maximize it.
  - Applying conservative principles based on long-term sustainability, and ensuring that conservation and other management measures do not counteract each other.

7. International Cooperation Must Grow

WHAT WE KNOW: *Managing fisheries sustainably requires a sustained effort on the part of all fishing nations to coordinate management strategies and enforcement. Limited international cooperation to date has greatly undermined the success of many management efforts.*

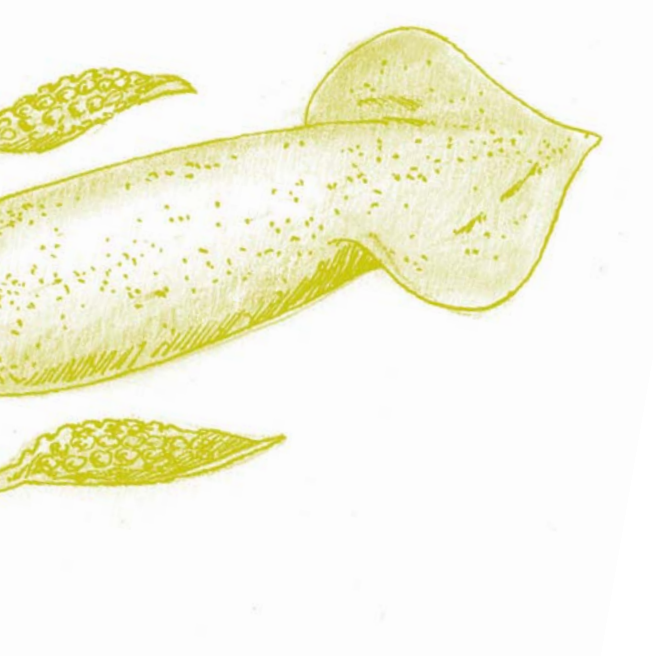
The oceans are a global common. Although coastal nations have nominal control over their Exclusive Economic Zones, in reality they cannot adequately manage many of the stocks within their waters without the help of other fishing nations. In international waters, the problem of joint management of fish stocks is even more pressing, as no one nation can assert legal authority. Realizing their interdependence, fishing nations have crafted treaties to formalize common responsibilities and establish ground rules for managing fleets. They have also created institutions—Regional Fisheries Bodies—to jointly manage high seas and straddling stocks. These regional organizations and the actions taken under international treaties have become the first line of defense against illegal fishing and non-compliance with fishing regulations. But, like other measures in global fisheries management, they are undermined by half measures on the part of many nations, or outright disregard for these international commitments by some countries.

WHAT WE NEED TO DO: *Increase compliance of fishing nations with international fishing treaties and strengthen the mandates of Regional Fisheries Bodies. Discourage countries from keeping open vessel registers, which facilitate irresponsible fishing and the use of "flags of convenience."*

The international fishing treaties now in place, especially the Law of the Sea, the UN Fish Stocks Agreement, and the Compliance Agreement, provide an adequate framework for international cooperation. The task now is to increase willing compliance with these, and active oversight of whether nations are fulfilling their commitments. In the case of Regional Fisheries Bodies, more groundwork needs to be done to strengthen the charters of these organizations, resolve conflicts among members, and increase performance oversight.

Responsible fishing nations should no longer keep open registers for fishing vessels, which too often are used to facilitate illegal and irresponsible fishing. Illegal fishing—often under the cover of a flag of convenience—is so widespread that many countries consider it their highest management priority.

Achieving sustainable fishing practices and healthy fish stocks will require action at many levels, from changes in national economic development plans, to changes in how fishing rights are allocated, and better compliance with international norms. It will also require a more concerted effort by nations to adopt and implement policies that reduce bycatch, emphasize ecosystem functioning, and expand markets for sustainably harvested fish.



Priority Actions:

- ***Strengthen the mandates and terms of reference*** of Regional Fisheries Bodies (RFBs), so that they specifically incorporate concepts put forward in contemporary fishing agreements, such as the ecosystems approach under the FAO Code of Conduct for Responsible Fisheries.
- ***Strengthen the capacity*** (staffing and funding) of recently established RFBs so they become more apt to press for compliance among member nations.
- ***Discourage nations from keeping open vessel registers*** and allowing "flags of convenience." At a minimum, discourage nations that have signed the Compliance Agreement or the FAO Code of Conduct from keeping such registers.
- ***Increase the use of "blacklisting"*** (disallowing known illegal vessels from landing their catch), and "white-listing" (allowing only registered and compliant vessels to land their catch) to combat illegal, unreported, and unregulated fishing.
- ***Reconcile environment and trade*** by granting observer status at the WTO to the UN Environment Programme and to the secretariats of international environmental treaties (e.g., Convention on Biological Diversity [CBD]).
- ***Incorporate the precautionary approach*** into WTO and other trade rules (particularly regional agreements) by harmonizing these rules with the implementation of international environmental treaties, such as the CBD.
- ***Reduce environmentally harmful subsidies*** through negotiations within the WTO and other trade bodies, especially as they relate to fisheries.

8. Consumer Awareness Can Boost Sustainable Fishing

What We Know: *Consumer demand is a key driver of overfishing, but it can be an equally powerful force for adopting sustainable practices. Public awareness of the fisheries crisis is growing, but the connection between what consumers purchase and consume, and how fish are caught, raised, and processed is not well known. Changes in consumer behavior can influence and drive demand for sustainably harvested fish and fishery products.*

Consumers seek low prices, quality, and convenience, but they also value environmental responsibility. Unfortunately, unless they are explicitly told—through labeling or public awareness campaigns—they are usually ignorant of the environmental impacts of their consumption patterns. However, once made aware of their choices, they can provide an economic incentive for fishers to adopt sustainable practices by purchasing products certified as sustainably harvested.

What We Need to Do: *Make fish consumers aware of the dimensions of the fisheries crisis and their part in it. Encourage them to take an active role in supporting sustainable fisheries. Educate consumers on which seafood products are sustainably harvested, and which should be avoided because of their high environmental impacts.*

NGOs, scientific organizations, and even government agencies have an important role to play in educating the public on the plight of world fisheries and informing them on how they can become responsible consumers. Civil society groups needs to build capacity and understanding so that they can hold governments accountable to their international fishery commitments and elevate the status of fisheries management on the political agenda. Informed civil society groups can also generate stronger political support for better management and can play a more active role in influencing the performance of both government and the fishing industry.

Priority Actions:

- ***Support ecolabeling programs*** that identify—and certify, based on sound science —which seafood products have been sustainably harvested, and that reflect the origin of the product and the species.
- ***Support efforts to define*** in a detailed manner what sustainable fishing practices mean for each fishery.

- ***Encourage governments*** to communicate objective information to the public about the state of fish stocks.
- ***Encourage NGOs and other groups*** to mount consumer awareness campaigns on the state of fish stocks, and provide guidance on which products are more ecologically sustainable.
- ***Encourage capacity building*** and support NGOs and other civil society groups so that they can independently monitor and evaluate progress by their governments in managing fisheries sustainably.

Y. KURA, WRI 2003

Sustainable fishing is key to food security of future generations in developing countries.

IN SUMMARY, Accommodating competing demands for fish and aquatic ecosystems while sustaining the fishing environment is quickly becoming one of our greatest environmental challenges. As reported here, the world's fisheries suffer from severe overcapacity, with too many boats chasing fewer and fewer fish. At the same time, global demand for fish and fishery products is growing and will continue to do so for the foreseeable future. As the resource declines, competition over fish intensifies, as do conflicting demands on fishing environments, particularly in inland waters and coastal zones. Today, competing interests such as hydropower development, tourism, and water for agriculture are, for the most part, taking precedence over fisheries. Conventional management institutions and approaches, designed originally to deal with single-sector activities, are no longer suited for resolving conflicts among the various players, and rarely allow for wider stakeholder participation.

New institutional arrangements that can adopt an integrated or ecosystem approach to resource management are urgently needed. This report has presented different institutional structures and legal frameworks that can help us achieve this goal—from international commitments through established fishing agreements such as the Code of Conduct, to national strategies that incorporate fisheries into development and poverty reduction strategies. The need for industry, fishers, aquaculturists, and consumers to participate in shaping the way we manage fisheries in the future has also been highlighted. *Fishing for Answers* has especially stressed the need to pay attention to small-scale and inland fisheries, both in terms of monitoring and management. Finally, a sustained political commitment to re-orient fisheries subsidies will also be needed to shift our current way of managing to a more holistic and ecosystem-based approach.