Charting a Course to Sustainable Fisheries

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CEA California Environmental Associates

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Contents

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ACRONYMS

ACIAR – Australian Centre for International Agricultural Research
ADB – Asian Development Bank
APFIC – Asia Pacific Fisheries Commission
BRD – bycatch reduction devices
BMSY - the biomass associated with maximum sustainable yield
CBD – Convention on Biological Diversity
CBFM – Community-based fisheries management
CCAMLR – Convention on the Conservation of Antarctic Marine Living Resources
CCCHFA – Cape Cod Commercial Hook Fishermen's Association
CCRF - Code of Conduct for Responsible Fisheries (United Nation's Food and Agriculture Organization)
CCSBT - Commission for the Conservation of Southern Bluefin Tuna
CFP – Common Fisheries Policy
CGIAR - Consultative Group on International Agricultural Research
CITES – Convention on International Trade in Endangered Species
CI – Conservation International
CPUE – catch per unit effort
CSR – corporate social responsibility
CTI – Coral Triangle Initiative
DANIDA – Danish International Development Assistance
DFID – Department for International Development (UK)
DFO – Department of Fisheries (Canada)
DSF - David Suzuki Foundation
EAC - Ecology Action Centre
EBFM – ecosystem-based fisheries management
EBM – ecosystem-based management
EDF – Environmental Defense Fund
EEZ – exclusive economic zone
ETPS – Eastern Tropical Pacific Seascape
EU – European Union
FAA – fishery access agreement
FAD – fish aggregating device
FAO – Food and Agriculture Organization (UN)
FMSY – the fishing mortality rate resulting in maximum sustainable yield
FIP – Fisheries Improvement Project
FIT– Fisheries in Transition
GEF – Global Environment Facility
GGGI – Global Green Growth Institute
GMRI – Gulf of Maine Research Institute
GOL - The Pew Global Ocean Legacy Project
GTZ - Gesellschaft für Technische Zusammenarbeit
HCR – harvest control rule
IADB – Inter-American Development Bank
IATTC - Inter-American Tropical Tuna Commission
ICCAT – International Commission for the Conservation of Atlantic Tunas
IFFO – International Fishmeal and Fish Oil Organization
IFQs – Individual Fishing Quotas
IISD – International Institute for Sustainable Development
IMACS – Indonesia Marine and Climate Support
IOTC – Indian Ocean Tuna Commission
ISSF – International Seafood Sustainability Foundation
IFQs – Individual Fishing Quotas
ITQs – Individual Transferable Quotas
IUCN – International Union for the Conservation of Nature
IUU – Illegal, Unregulated and Unreported
IVQ – Individual Vessel Quota
JICA – Japan International Cooperation Agency
LRFFT – Live reef food fish trade
LTLF – Low trophic level fisheries
LTMP - Long-term management plan
MLPA – Marine Life Protection Act
MMAF – Ministry of Marine Affairs and Fisheries
MBRS – Mesoamerican Barrier Reef System
MEY – Maximum Economic Yield
MMT – Million metric tons
MPA – Marine protected area
MRAG – Marine Resources & Fisheries Consultants. Ltd.
MSA – Magnuson-Stevens Act
MSC – Marine Stewardship Council
MSY – maximum sustainable yield
NGO – non-governmental organization
NOAA – National Oceanic and Atmospheric Administration (US)
NOP – National Oceanic Program
NORAD – Norwegian Agency for Development Cooperation
NPFMC – North Pacific Fisheries Management Council
OECD – Organization for Economic Co-operation and Development
OSPAR – Convention for the Protection of the Marine Environment of the North-East Atlantic
PISU – Prince's International Sustainability Unit
PNCIMA – Pacific North Coast Integrated Management Area
PUC – Public utilities commission
RAP – Regulatory Assistance Project
RFMO – Regional Fishery Management Organization
SEAFDEC - Southeast Asian Fisheries Development Center
SIDA – Swedish International Development Cooperation Agency
SFP – Sustainable Fisheries Partnership
SPR – spawning potential ratio
TAC – total allowable catch
TED – turtle excluder devices
TNC – The Nature Conservancy
TURF – territorial use rights in fisheries
UBC – University of British Columbia
UCSB – University of California, Santa Barbara
UN – United Nations
UNCLOS – UN Convention on the Law of the Sea
UNEP – United Nations Environment Programme
UNFSA – UN Fish Stocks Agreement
USAID – United States Agency for International Development
UW – University of Washington
WCS – Wildlife Conservation Society
WSC – Wild Salmon Center
WWF – World Wildlife Fund

ABOUT THIS REPORT

This is a complex report addressing the extent, causes, and potential solutions to global overfishing. To accommodate the divergent interests and backgrounds of our readers, we have structured the report for selective reading. Each chapter begins with a short summary that lays out its major arguments. Each argument is then picked up again and discussed in greater detail, with links to charts and appendices which provide yet additional analysis and detail. The reader is thus able to undertake "deep dives" in specific areas of interest.

Our findings are presented in three main chapters:

Chapter 1: The status of global fisheries. Overfishing has impoverished the integrity of the ocean's ecosystems to a much greater degree than previously acknowledged. While developed country fisheries are, by and large, slowly moving towards restoration, the ocean ecosystems managed by developing countries and the high seas are often in severe decline.

Chapter 2: Root causes and solutions. The management solutions to overfishing are well known. However, highly resilient economic and institutional barriers complicate the transition to these management regimes. Industrial fisheries are typically best managed with output-based management systems strengthened with harvest control rules and catch shares, while challenging multi-species coastal fisheries are often best managed through a combination of input-based controls and spatial management systems. However, the costs and benefits of fishery reform and recovery accrue asymmetrically across the fishery value chain, often creating powerful losers whose resistance to reform cannot easily be overcome by inherently weak fishery management institutions.

Chapter 3: A global agenda for sustainable fisheries. Although fisheries in different regions are idiosyncratic, they often share similar economic and institutional barriers to sustainable fishing. To overcome these barriers there is a basic suite of tools that may be used to promote sustainable fisheries management globally. These tools are: policy reform, governance reform, market transformation efforts, no-take protected areas, major improvements in the intergovernmental context, and technical capacity building.

CHAPTER 1: THE STATUS OF GLOBAL FISHERIES

SUMMARY

Overall conclusion:

Overfishing has impoverished the integrity of the ocean's ecosystems to a much greater degree than previously acknowledged

Argument 1: The overall state of fishery stocks is much worse than previously known. Global marine fisheries landings peaked in 1988 at approximately 80 million tons, and have been declining slowly at a rate of approximately 500,000 tonnes per year. This relatively stable level of global catches, however, masks deteriorating fundamentals in marine fisheries. Catch levels have been supported by increasing effort, expansion into previously underexploited regions of the ocean, and fishing deeper into the water column. We may be reaching the limit of this expansion, with potentially serious consequences for global fisheries. While several recent reports have issued somewhat optimistic assessments of the state of global fisheries, concluding that about half of overfished stocks are now in recovery, these reports are based almost entirely on data rich fisheries in the developed world; this focus represents a major bias. Our own analysis, using a more representative sample, shows that the majority of global stocks have been reduced to well below the levels needed to support maximum sustainable yields, with no relief in sight. [See Appendix 1 – Global Fishery Trends]

Argument 2: Developed countries are slowly and unevenly stabilizing and rebuilding fisheries. Despite the declining fundamentals in global marine fisheries, there is significant variation in the state of stocks throughout the world. The developed world is largely, though somewhat unevenly, implementing measures that protect intact stocks or place their fisheries on the pathway to recovery. A recent analysis of fisheries in upper-income countries determined that 63% of assessed stocks required rebuilding, but exploitation had been reduced for most of these stocks below F_{MSY} – a marked improvement indicating a broad sweep of reforms. Countries including New Zealand, Iceland, the United States (U.S.), Norway, and Australia are the furthest along in implementing successful fisheries management with just a minority of their stocks still subject to overfishing. With the Common Fisheries Policy (CFP) reform under debate now, Europe may be on the cusp of following suit. However, overfishing in some areas of the developed world remains surprisingly resistant to reform, most notably in southern Europe and eastern Canada, where science often takes a secondary role to the politics of avoiding painful cuts in effort. Across most developed countries, small coastal fisheries are often poorly managed and still subject to overfishing.

Argument 3: Middle income countries have more mixed trends, with large industrial fisheries often better managed than smaller or coastal stocks. Fisheries in the industrializing world have followed a similar trajectory to those in the industrialized world. Excluding highly volatile anchoveta yields, landings of upper-middle income countries peaked in 1988 at approximately 22 million tonnes, and declined to 14 million tonnes by 2008. The decline in landings is primarily due to decreased landings of pollock in Russia and pilchards in Peru and Chile. These stocks are highly impacted by changes in environmental conditions, but heavy fishing pressure is also believed to have been an important driver of their declines. While some of the decline in landings may be attributable to effective management interventions to reduce fishing mortality, particularly for Russian pollock, a significant amount is presumably driven by overfishing, but poor stock assessment data is available from middle income countries to validate this claim. Nearly two thirds of the landings in these countries are small pelagic species including anchoveta, sardines, and herring. In general, these stocks and other fisheries in productive upwelling systems are relatively resilient to overfishing and are reasonably healthy—this includes Peru, Namibia, and South Africa where catch share systems have been widely adopted for major stocks. Small-scale fisheries and fisheries in less productive ecosystems continue to be overfished.

Argument 4: Developing country fisheries appear to be seriously overexploited. Relatively stable global landings since 1988 mask the real story: lower-middle income countries have dramatically increased fishing effort over the last twenty years, essentially in the absence of effective fishery management. This has resulted in an entirely unsustainable level of effort and a spike in landings that plateaued a decade ago. The maintenance of high landings now comes at the price of tragic declines in ecosystem health, as the rigorous pursuit of highly productive species has compensated for the depletion of high trophic level fisheries. With growing population pressure, high levels of political decentralization, and weak institutional capacity, there is little expectation that government-led reforms will reverse these trends soon. Stock assessments are all but absent, output controls are rarely used, and most fisheries are in a state of de facto open access. The situation is most serious in Southeast Asia, although West Africa and Central America are not far behind.

Argument 5: Regional Fisheries Management Organizations (RFMOs) are on the knife's edge. The open ocean, covered by UN-authorized regional fishery management organizations (RFMOs), is in a precarious situation. Many open-ocean stocks have been spared from overfishing in the past by the high costs of this type of fishing, and while some of the largest stocks (e.g., skipjack) remain healthy, pressure on open-ocean fish continues to rise. The RFMOs' poor conservation record and failure to set scientifically sound total allowable catches (TACs) makes the future of these stocks highly uncertain. Economically valuable species like bluefin tuna are already severely overfished, and mortality continues to increase for less economically attractive species such as bigeye and skipjack. Fisheries managed by RFMOs also have severe impacts on seabirds, turtles, and sharks, which the RFMOs have by and large failed to adequately address. Without serious institutional reforms in RFMOs, stocks of highly migratory species are likely to worsen and threatened species impacted by bycatch will be pushed closer to collapse.

Argument 6: The habitat and wildlife effects of fisheries are disastrous across almost all geographies. In addition to the impact on direct target species, the effects of fishing on habitat and wildlife remain a major issue across all geographies. Bottom trawls and other mobile gear sweep across the continental shelves and slopes of the world's oceans regularly; essentially any area that can be fished is being fished, with the most productive areas trawled multiple times per year. Poor data exists on the overall ecosystem and fishery productivity impacts of bottom habitat modification, but studies have clearly demonstrated that trawled areas show reduced biomass, species size, and diversity.[1] Many scientists believe that trawling also has non-trivial consequences for long-term fisheries productivity and ecosystem health. Commitments have been made to protect the ocean from the impacts of fishing, but coverage of marine protected areas (MPAs) has reached just 1.3% of the world's oceans to date, and most of those are paper parks. More urgently, bycatch remains a persistent problem in fisheries and is the primary factor pushing many threatened populations and species of seabirds, turtles, marine mammals, and sharks to the brink of extinction. Technical solutions for many types of bycatch mitigation are well known, but their adoption is not proceeding at the pace needed to prevent future extinctions.

[1] National Research Council, 2003. Effects of Trawling and Dredging on Seafloor Habitat. National Academy Press. Washington, D.C.

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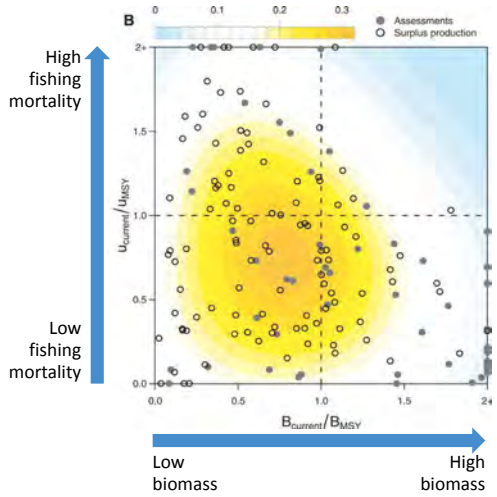
Figure 1-1

63% of assessed stocks (mostly in high income countries) need rebuilding, but about half have reduced fishing mortality to below U_{MSY}

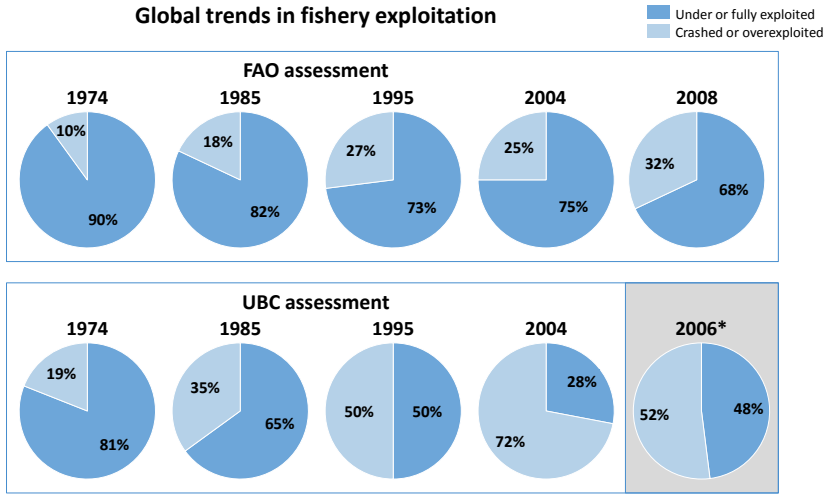


- 37% of assessed stocks do NOT need rebuilding
- Of those, 77% are in the Pacific

Source: Worm, Boris, et al., 2009. Rebuilding Global Fisheries. Science Vol. 325, 578.

Figure 1-2

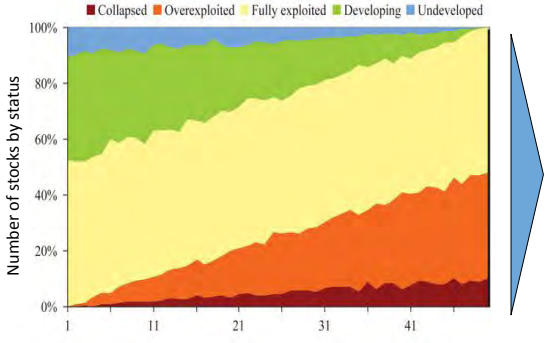
Wide data variation regarding the extent of overexploitation



Source:FAO SOFIA 2008; FAO SOFIA 2010; Pauly et al., 2008; www.seaaroundus.org
*2006 data is from most recent UBC assessment and includes a new category called "rebuilding," (10%) which is captured in the "crashed or overexploited" category above

Figure 1-3a

Using catch-history to determine the state of fish stocks may be biased towards classifying stocks as overfished or depleted

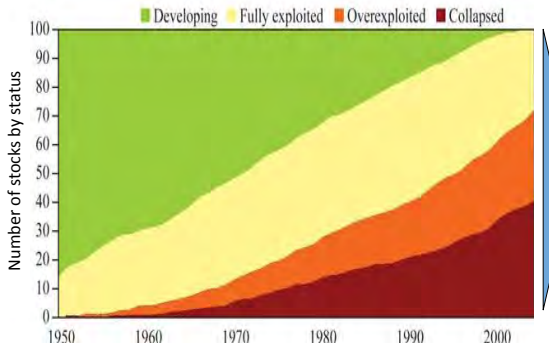


Results of applying the algorithm for defining status classes to simulated random numbers in 50-"year" time-series for 100 "stocks"

Source: Daan, Niels, et. al., 2011. Apocalypse in world fisheries? The reports of their death are greatly exaggerated. ICES Journal of Marine Science

Figure 1-3b

Using catch-history to determine the state of fish stocks may be biased towards classifying stocks as overfished or depleted



Results of applying the algorithm for defining status classes to FAO catch statistics for various LME's, 1950–2004

Source: Daan, Niels, et. al., 2011. Apocalypse in world fisheries? The reports of their death are greatly exaggerated. ICES Journal of Marine Science

CHAPTER 1: THE STATUS OF GLOBAL FISHERIES

Argument 1:

The overall state of fishery stocks is much worse than previously known

Formally assessed fish stocks appear reasonably sound, but do not provide a representative sample of global fisheries. The state of global fisheries is the subject of a lively debate. In the late 1800s, Thomas Huxley asserted, "all the great sea fisheries are inexhaustible." This concept has long been put to rest, but a lively academic debate continues on the true present and future state of global fish stocks and marine ecosystems. Our quantitative and qualitative research suggests that while major fisheries in the industrialized world are generally either healthy or on the pathway to recovery, the overall majority of global fisheries are on a path towards depletion.

In 2006, a paper in Science by Worm et al. triggered great concern by indicating that if the current rate of collapse in fish stocks remained constant, all global fisheries would be collapsed by 2048.[2] While this was a calculation rather than a prediction, the paper elicited heated dispute over the value of catch-based assessments versus assessments that use abundance data. In a follow-up publication in 2009, Worm, Hilborn, et al. attempted to settle the discussion with a new assessment of global fisheries, relying on stocks for which greater data was available.[3] Their analysis found that 14% of global fisheries with stock assessments were collapsed, and 63% were in need of rebuilding. However, unlike the previous dire predictions, they found that about half of these fisheries that required rebuilding had reduced exploitation rates below F_{MSY} (the fishing mortality rate resulting in maximum sustainable yield), and appeared to be on a pathway to recovery. [Figure 1-1]

This Rebuilding Global Fisheries analysis was a seminal piece of work, but has failed to bring about consensus on the state of global fisheries. At the center of the debate is an issue of methodology. The authors in Science confined their sample to those stocks for which sufficient data was available. This limited the data set to stocks from the U.S., Canada, Australia, New Zealand, Argentina, and South Africa, plus some international fisheries for which stock assessments and management systems are in place. For the large majority of global fisheries, no such data is available, and there is an open question about how applicable the findings are to regions that lack fishery management institutions strong enough to mandate sophisticated stock assessments. A review of other studies does little to clear up the debate: in 2008, the Food and Agriculture Organization (FAO) estimated that just 3% of stocks were depleted, 28% overexploited, 53% fully exploited, 15% underexploited, and 1% recovering from depletion;[4] while catch-based analyses by University of British Columbia (UBC) indicate that more than 70% of global fisheries are overexploited or collapsed.[5] UBC has since updated their methodology for assessing the state of stocks, including adding "rebuilding" as a new stock status category. They now find that 52% of stocks are overfished compared to 32% for FAO. [Figure 1-2] How can there be such a large divide amongst experts in the field on the health of fisheries? The answer lies mainly in the interpretation of indicators for data-poor fisheries.

The current debate is focused on the merits of data rich assessments versus catch record interpolations. To estimate the state of stocks for unassessed fisheries, extrapolations are often made based on historical catch data. Those who believe that the collapse of global fisheries is overstated argue that using catch data to estimate the health of stocks is unreliable and biased towards classifying stocks as overfished or collapsed [Figures1-3a,b]. That argument appears to be correct, at least for well-managed fisheries, where effort is often reduced in order to maintain biomass.

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[2] Worm, Boris, et al., 2006. Impacts of Biodiversity Loss on Ocean Ecosystem Services. Science, Vol. 314, 787.

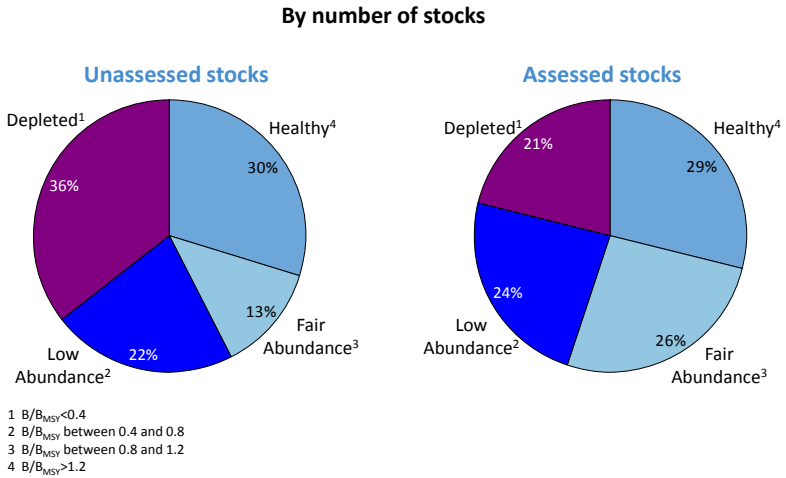
[3] Worm, Boris, et al., 2009. Rebuilding Global Fisheries. Science Vol. 325, 578.

[4] Food and Agriculture Organization of the United Nations, 2010. The State of World Fisheries and Aquaculture.

[5] Pauly, D. 2007. The Sea Around Us Project: Documenting and Communicating Global Fisheries Impacts on Marine Ecosystems. AMBIO: a Journal of the Human Environment 36(4): 290-295.

Figure 1-4

Unassessed stocks in worse shape than assessed stocks

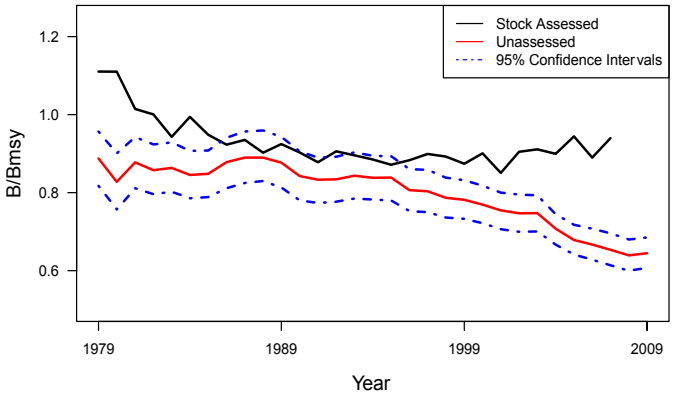


1 B/B_{MSY}<0.4
2 B/B_{MSY} between 0.4 and 0.8
3 B/B_{MSY} between 0.8 and 1.2
4 B/B_{MSY}>1.2

Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-5

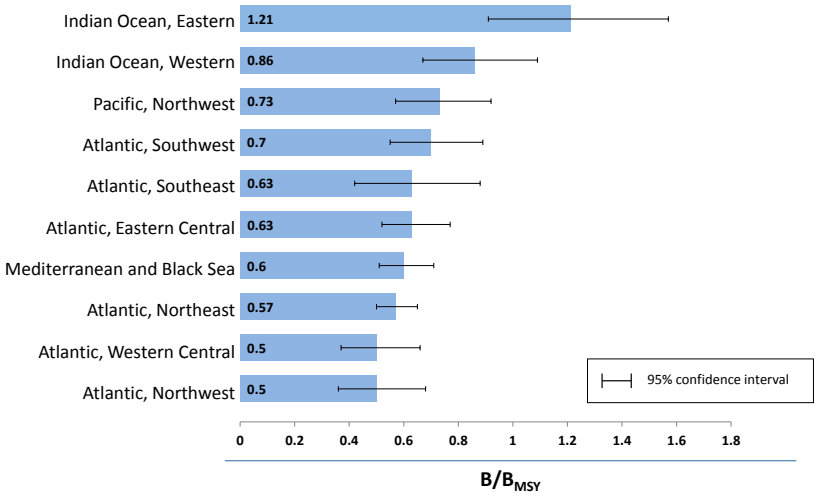
The median biomass of assessed stocks has stabilized and appears to be recovering. Unassesed stocks are in worse shape and their biomass continues to trend lower.



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-6

State of unassessed stocks varies by ocean region



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Methodologies such as the FAO's combine the available data with local knowledge on fishery status; however, the degree to which the FAO assessments are up to date or accurate for regions without stock assessments is also up for debate.

Our new analysis suggests that the state of unassessed stocks is substantially worse than assessed stocks. As a part of this effort, we commissioned Professors Steven Gaines and Chris Costello at the University of California, Santa Barbara (UCSB) to develop a methodology which reliably estimates the status of fish stocks for which no formal stock assessment exists.[6] They succeeded.

Starting with the existing stock assessments, the UCSB team was able to deduce a projection function which combines catch data with key biological indicators to arrive at a statistically valid projection of current stock status. The suite of regressions were found to have a good fit when tested on the assessed stock database, producing r^2 values between 0.21 and 0.47. These numbers are quite good given the complex and error prone nature of the dependent and independent variables. The team also assessed the ability of the model to accurately predict whether a fishery was under or overfished (i.e., whether the ratio of current biomass to the biomass associated with maximum sustainable yield, B/B_{MSY}, was less than or greater than 1), and found that it successfully identified the correct quadrant 75% of the time.

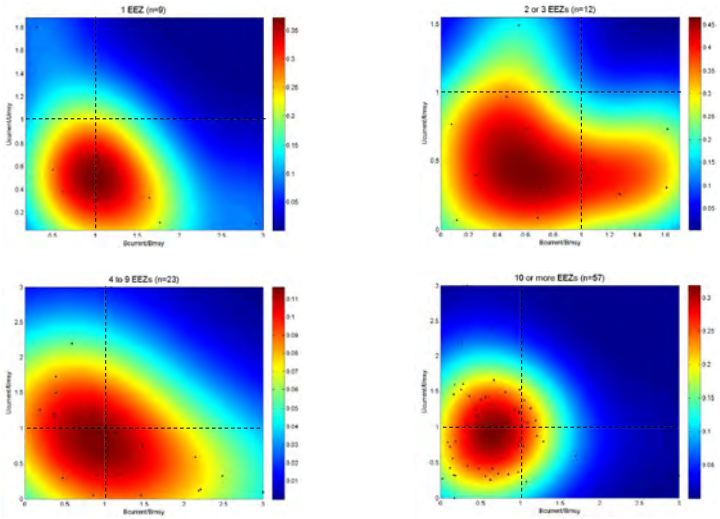
The UCSB team then applied this algorithm to 1,793 unassessed stocks, chosen to be a representative sample of global stocks. Their findings are far more disturbing than those based on assessed stocks only: 58% of the unassessed stocks were below 0.8 B/B_{MSY}, while 36% were below 0.4 B/B_{MSY}, a level at which recruiting success is far from certain. [Figure 1-4] Their analysis not only shows that unassessed stocks are in worse shape, but also that their median biomass continues to decline. Biomass of assessed stocks, on the other hand, appears to have stabilized and is showing signs of rebuilding. [Figure 1-5] There was significant heterogeneity in stock health between ocean regions, with mean biomass ratios for unassessed stocks 0.6 or less in the Mediterranean and Black Sea, the Northeast Atlantic, Western Central Atlantic, and the Northwest Atlantic. [Figure 1-6] Interestingly, among unassessed stocks, those in the developed world were found to be *more* depleted than those in the developing world. For example, more than half of the stocks in the United States are unassessed and, based on the findings of this study, may continue to face overfishing.

In the developing world, where essentially all stocks are unassessed, the general consensus gleaned from dozens of interviews with in-country experts was that fishery management capacity is weak throughout most (though not all) of Asia, Africa, and South and Central America, and industrial stocks are fully or overexploited. Furthermore, coastal and small-scale fisheries in many regions have grown with population and are mostly unmanaged. For most regions, the professional opinion was that in general stocks are well below optimal levels and that effort remains too high; these findings are consistent with the notion that, outside of the developed world, the expansion of fishing effort is masking stock declines in most fisheries. In regions without effective controls on fishing mortality, the logical assumption in open access systems is that mortality is likely to exceed optimal levels. [See Appendix 2 – Global State of Stocks]

[6] Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-7

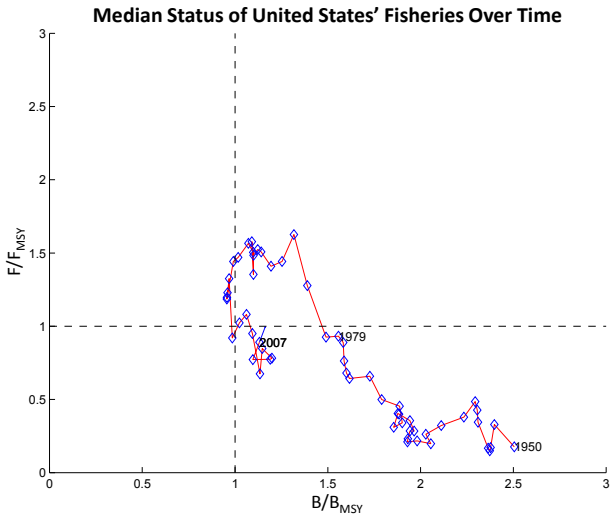
Fish that cross several EEZs are more likely to be overfished



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-8a

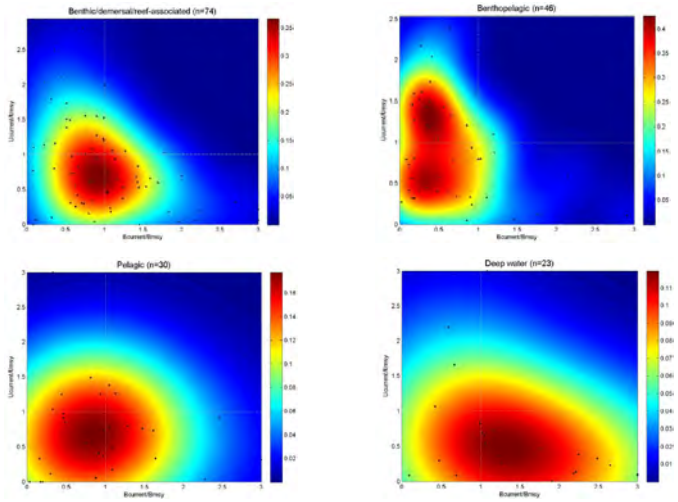
On average U.S. fisheries have reduced fishing pressure and improved biomass while the E.U. has struggled to reduce fishing mortality



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

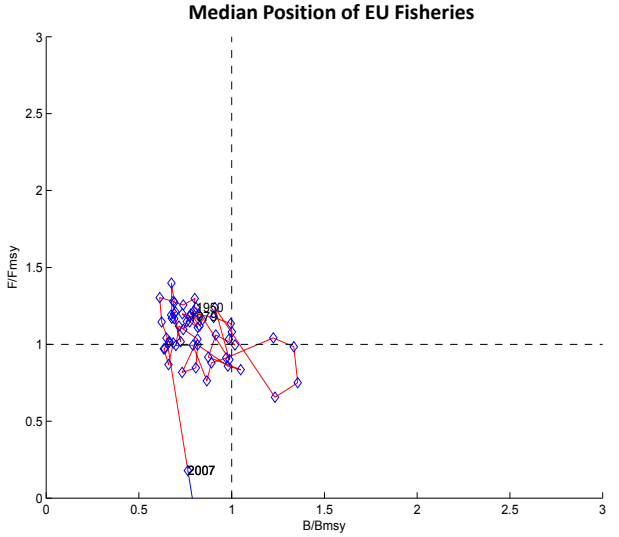
Figure 1-9

Habitat type is not a clear predictor of stock health



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-8b



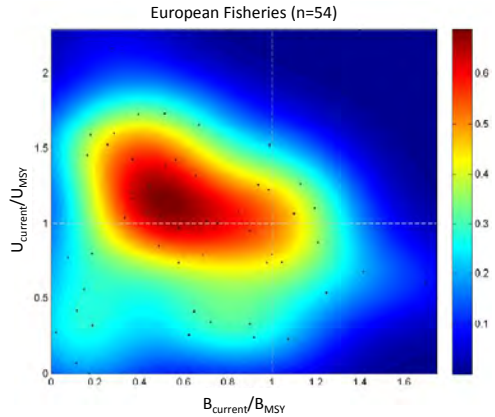
Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

A deeper assessment of available stock assessment information also indicates significant geographic trends. The team at UCSB further dissected the assessed stocks to identify additional trends. Not surprisingly, species crossing multiple exclusive economic zones (EEZs) are likely to be depleted (i.e., $B/B_{MSY}<1$) with overfishing still occuring (i.e., $F/F_{MSY}>1$). [Figure 1-7] This analysis is congruent with our findings that fisheries in the European Union (E.U.) and RFMOs have historically been among the most poorly managed fisheries in the developed world, despite strong scientific and institutional capacity. The divergence in the health of stocks over time in the E.U. and U.S. demonstrates the primacy of decision-making processes and governance bodies in determining the health of fishery stocks. [Figures 1-8a,b]

Other factors such as the trophic level or the habitat type (pelagic, benthopelagic, deep water) of the target species were surprisingly unpredictive of the health of these assessed stocks. [Figure 1-9] Instead, geography and country appeared to predict the clearest trends and patterns [Figures 1-10a,b,c], arguing that the primary factor determining stock health is a fishery management system, rather than a favorable biological profile of a fishery.

Figure 1-10a

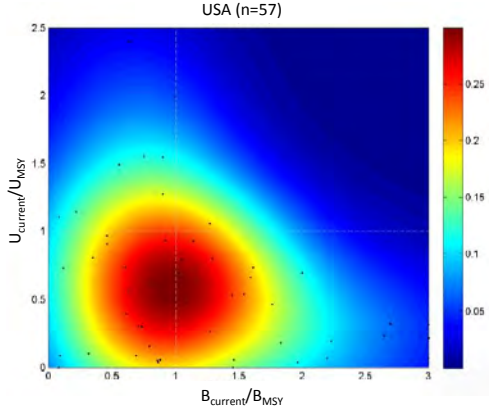
Country type is strong predictor of stock health



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-10b

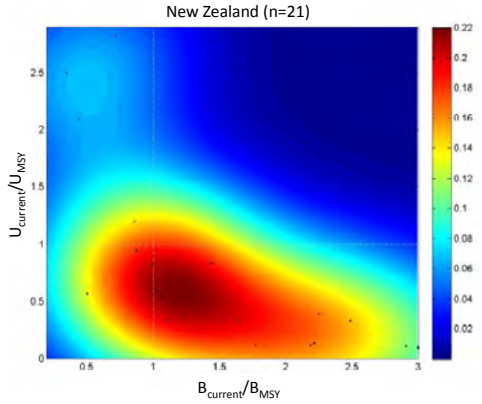
Country type is strong predictor of stock health



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-10c

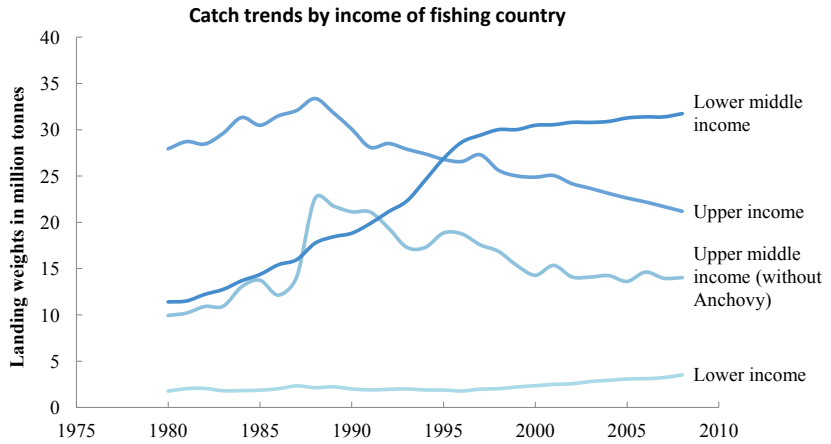
Country type is strong predictor of stock health



Source: Costello, et al. In Press. Status and Solutions for the World's Unassessed Fisheries. Science.

Figure 1-11

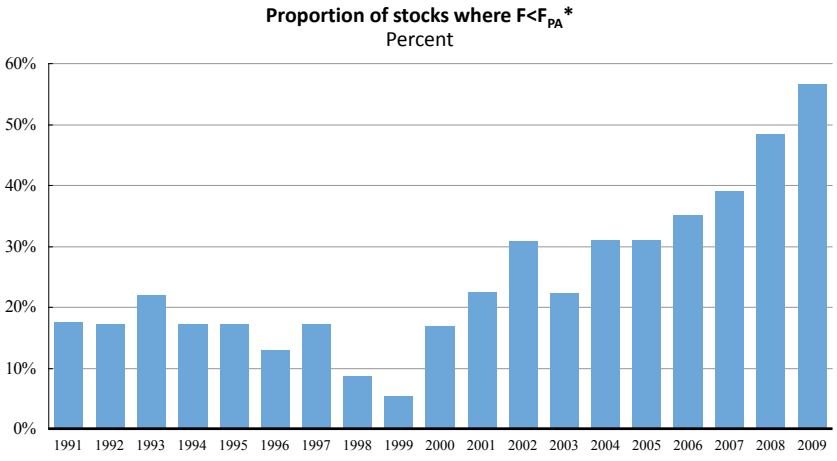
Lower middle income country landings have substituted developed country landings



Source: FAO FISHSTAT; SAUP; World Bank

Figure 1-12

Northern Europe still overfished, but improving



* F_{PA} is a higher fishing mortality than F_{MSY}

Source: Casey, J. 2010, Trends in Stocks and Fisheries Since 2002, STECF

CHAPTER 1: THE STATUS OF GLOBAL FISHERIES

Argument 2:

Developed countries are slowly and unevenly stabilizing and rebuilding fisheries

The majority of large commercial fisheries in the developed world are healthy or in restoration. Since 1988, upper income country landings have dropped from 33 to 21 million tonnes [Figure 1-11]. Part of this decline is associated with reductions in fishing mortality needed for ongoing rebuilding efforts. Countries such as Norway, New Zealand, Australia, Iceland, and the United States have either maintained stock health or significantly reduced the number of stocks being overfished. In the U.S., the Magnuson-Stevens Act and subsequent amendments have created a mandate to put overfished stocks into restoration; 83% of all federally managed stocks with known status are now being sustainably harvested and 77% have biomass above the overfished level.[7] In New Zealand, 69% of stocks are above management targets, reflecting mandatory rebuilding plans for all fisheries that are still below target thresholds.[8] Similarly, Australia reports overfishing for only 12% of stocks in 2009.[9]

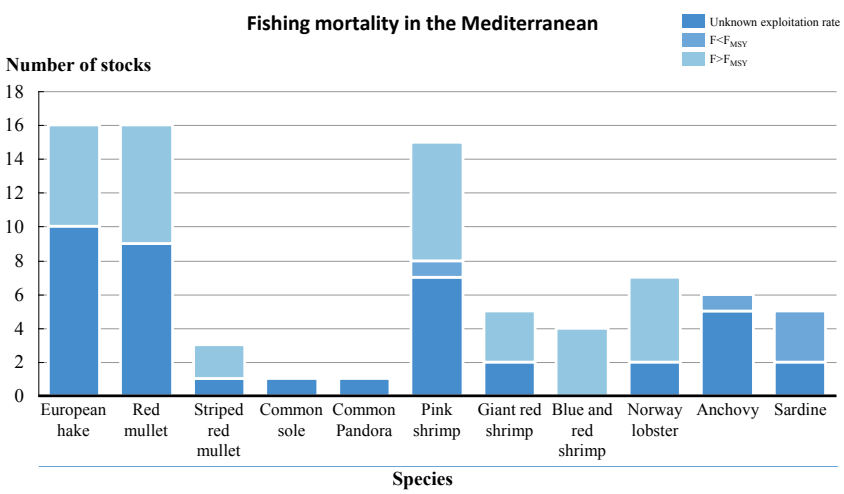
Other developed countries such as Japan and Canada have not systematically ended overfishing, but landings and stock status trends appear to be relatively stable. In Japan, for example, 50 stocks are currently under recovery plans. But, TACs are set using both science-based recommendations and socio-economic considerations, which can lead to exploitation levels above F_{MSY}. The overall picture in Japan is one in which there is a slow decline in catch levels for many species with increasing volatility, while other species appear to be stable. Part of the decline may be due to reduced effort, particularly in the distant water fleet. In Canada, the picture is similarly mixed. Management of several stocks in the Canadian Pacific is on par with the best management in the world, but overfishing continues in some Atlantic fisheries. The Department of Fisheries and Oceans (DFO) sometimes sets the TAC above scientific advice in order to achieve social and economic goals, which has led to continued overfishing as decision-makers have tried to solve rural employment problems with fisheries.

In Europe, the picture is much less sanguine. The majority of stocks are overfished with overfishing still occurring: assessed biomass is at just 34% of B_{MSY} and 70% of stocks are below B_{MSY}.[10] However, with the implementation of long-term management plans with harvest control rules, this situation appears to be slowly improving. Through the Johannesburg Declaration, the European Commission adopted a management objective to recover stocks to levels that can produce maximum sustainable yields by 2015.[11] Since the declaration, fishing mortality has been reduced in Northern Europe through the adoption of long-term management plans with harvest control rules. [Figure 1-12] However, much more progress is needed as fishing mortality remains above F_{MSY} for 29 of the 35 fisheries with stock assessments.[12] Achieving the mortality targets for the remaining stocks will require that management plans are faithful to the Johannesburg Declaration, and do not fall victim to the highly politicized decision-making processes that have plagued E.U. fisheries in the past.

[7] NOAA Fisheries Service, 2012.Fish Stock Sustainability Index: 2012 Quarter 1 Update.
[8] New Zealand Ministry of Fisheries, 2011. Status of Fisheries. Accessed April 25th, 2011.
[9] Australian Bureau of Agricultural and Resource Economics, 2010. Fishery Status Reports 2009.
[10] Confidential interview.
[11] The Johannesburg declaration specifically calls for biomass greater than BMSY by 2015, but due to the current state of stocks and rebuilding times the practical application of the declaration is often interpreted as reducing F below FMSY by 2015.
[12] Casey, J. 2010. Trends in Stocks and Fisheries since 2002. Scientific, Technical and Economic Committee for Fisheries.

Figure 1-13

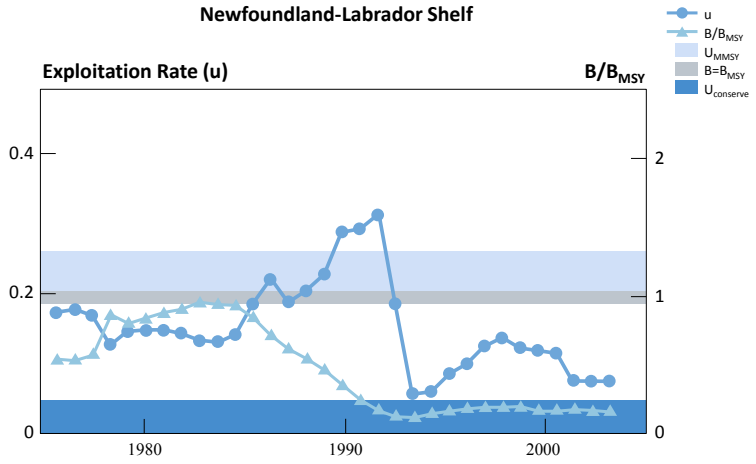
89% of stocks in the Mediterranean overfished



Source: STECF, 2010, Assessment of Mediterranean Stocks Part II

Figure 1-14

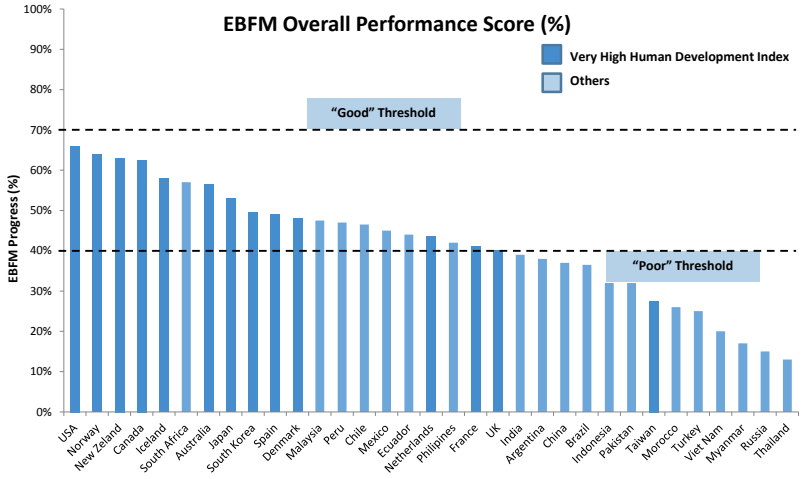
Despite recent progress reducing fishing mortality in E. Canada, biomass has not increased



Source: Worm, Boris, et al., 2009. Rebuilding Global Fisheries. Science Vol. 325, 578.

Figure 1-15

Developed countries have made the most progress, but several European nations appear to be lagging



Source: Pitcher, Tony, 2008. An Evaluation of Progress in Implementing Ecosystem-Based Management of Fisheries in 33 Countries. Marine Policy, 33, 223-232

Even in well managed countries, some overfishing is still occurring in difficult to manage fisheries and in politically difficult regions. Stock assessment data and fishery management plans typically only apply to the larger fisheries. Our interviews across the developed world indicate that even in well managed regions, some overfishing is likely to occur. Overfishing is much more likely to be present in low volume fisheries, including some weak stock fisheries, biologically vulnerable populations (e.g., highly migratory sharks), and in small coastal fisheries. For example, in the U.S., the stock status of state managed fisheries is poorly recorded, as they lack the same TAC and rebuilding requirements as federal fisheries. Even in California, state fisheries appear to be well below their optimal biomass.

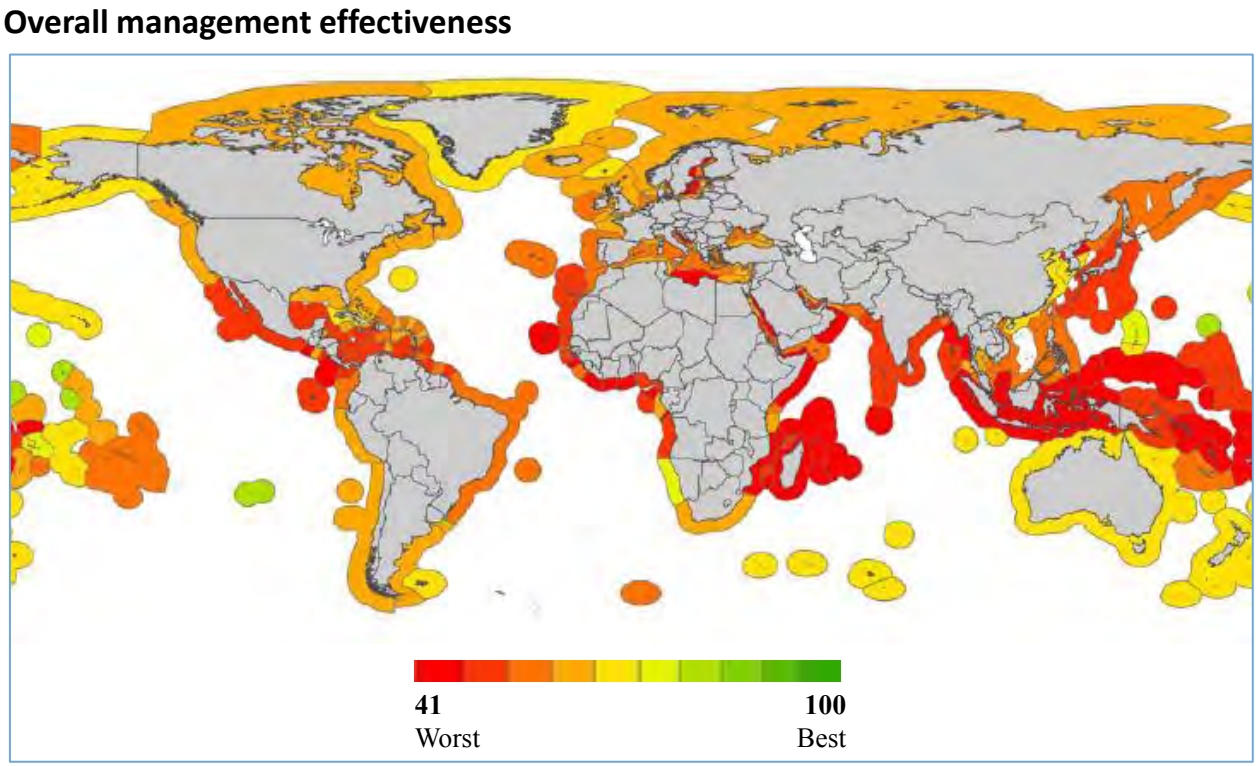
There remain several problematic regions within the developed world. In Southern Europe, the situation is terrible, with almost 90% of commercially important fish stocks below B_{MSY}, and 55% already outside of "safe" biological limits.[13,14] [Figure 1-13] Unlike Northern Europe, Mediterranean fisheries generally do not have the benefits of formal stock assessments or long-term management plans, except for the International Commission for the Conservation of Atlantic Tunas' (ICCAT) recovery plan for Eastern bluefin tuna (a plan that many view as inadequate to ensure the recovery of the stock).[15] In Eastern Canada, the DFO, tasked with restoring the depleted groundfish stocks, has to meet multiple and often seemingly incompatible objectives of environmental sustainability, economic viability, and social well being. The annual TAC setting is thus subject to a highly politicized process, and biomass has not increased sufficiently despite recent progress reducing fishing mortality. [Figure 1-14]

Developed countries are gradually transitioning past responsible stock management to focus more on ecosystem considerations such as habitat protection and low trophic level fisheries. With the successful implementation of rebuilding plans for directly targeted species, many countries in the developed world are gradually transitioning toward ecosystem based fisheries management (EBFM). We expect this approach to slowly build steam over the next decade. Precautionary TACs for low trophic level fish are currently a focus for campaigners in several regions including the U.S. (Atlantic herring, menhaden) and the Antarctic (krill). The expansion of marine protected areas is also slowly gaining traction in some regions (e.g., California (CA), Hawaii (HI), and Oregon (OR) marine reserves, E.U. marine protected areas (MPAs), Australia's National Representative System of Marine Protected Areas (NRSMPA)), albeit in a piecemeal fashion. No-trawl areas and the protection of critical habitats (e.g., offshore canyons, deepwater habitats) are another piece of the EBFM puzzle that has made some recent gains (e.g., The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the North Pacific Fisheries Management Council (NPFMC)). The idea that habitat protection and ecosystem integrity are critical to the long-term health of fisheries is now widely accepted. The growth of these initiatives has been concentrated in countries with relatively advanced fisheries management capacities. [Figure 1-15] Expanding EBFM into new areas may prove difficult since, unlike the maximum sustainable yield (MSY) management of targeted stocks, the industry's economic incentives are not always aligned with the establishment of no-trawl zones, lower TACs for low trophic level fisheries (LTLF), and choke species management. Adoption of EBFM is also inhibited by legal and scientific hurdles.

[13] European Environment Agency. 2010. Status of the fish stocks in ICES and GFCM fishing regions of Europe.
[14] European Commission. 2010. Assessment of Mediterranean Stocks Part II. Scientific, Technical and Economic Committee for Fisheries Sicily, Italy.
[15] See Appendix for an in depth analysis of the economics of bluefin recovery.

Figure 1-16

Middle income countries report moderate management effectiveness



Source: Mora, Camillo, et al., Management Effectiveness of the World's Marine Fisheries. PLOS Biol 7(6)

CHAPTER 1: THE STATUS OF GLOBAL FISHERIES

Argument 3:

Middle income countries have more mixed trends, with small pelagic fisheries and catch share fisheries better managed than smaller or coastal stocks

Overall landings in middle income countries are declining, which is a cause for some concern in the absence of stock assessment data.[16] Many of the world's most productive fisheries are found in middle income countries, such as the Peruvian anchoveta. Fisheries in middle income countries (Peru, Russia, Chile, Mexico, Malaysia, Argentina, South Africa, Brazil, Turkey, Namibia, etc.) have followed a similar trajectory to those in the industrialized world. Landings peaked in 1988 at approximately 22 million tonnes, but declined to 14 million tonnes by 2008. [Figure 1-11] Approximately one-half of the overall decline is attributable to a drop in landings of Russian pollock. Declines in landings of Chilean and Peruvian pilchard are also significant. While some of the decline in landings may be attributable to effective management interventions to reduce fishing mortality, a significant amount is also likely to be driven by overfishing. Poor stock assessment data is available from middle income countries to validate this claim; only a handful of fisheries are in the global stock assessment database.

Many major stocks are reasonably well managed, particularly high volume industrial fisheries with catch share systems in place. Nearly two-thirds of the landings in these countries are small pelagic species including anchoveta, sardines, and herring. In general, these pelagic stocks and other fisheries in productive upwelling systems are relatively resilient to overfishing and reasonably healthy. These stocks include Peruvian anchoveta, which is managed with a catch share system; whitefish in Namibia and South Africa where catch shares have been adopted for major stocks; and several major stocks such as scallops and squid in Argentina. In Russia, fishery management has historically been quite strong and science driven. Stocks remain mostly healthy, but several commercially important stocks (cod, king crab, salmon) are subjected to significant illegal, unregulated, and unreported fishing (IUU); and poaching activities. Other major stocks in the industrializing world (e.g., hake in Argentina, anchoveta in Chile) are overexploited. For example, in Chile, a strong and influential industry has prevented implementation of science-based TACs for anchoveta, and current TACs are set at a level so high that fishermen never come close to reaching the catch limit. The area straddling the border between Chile and Peru faces the compounding challenge of stocks that span management jurisdictions. The border stock is heavily exploited by both countries, as each nation tries to catch fish that may cross into the adjacent EEZ. Numerous other stocks are imperiled by the complication of transnational management. Surveys of fisheries management institutions indicate that middle income countries report moderate fisheries management effectiveness [Figure1-16], but there is no reason they should not be on par with the developed world in terms of their ability to manage major stocks.

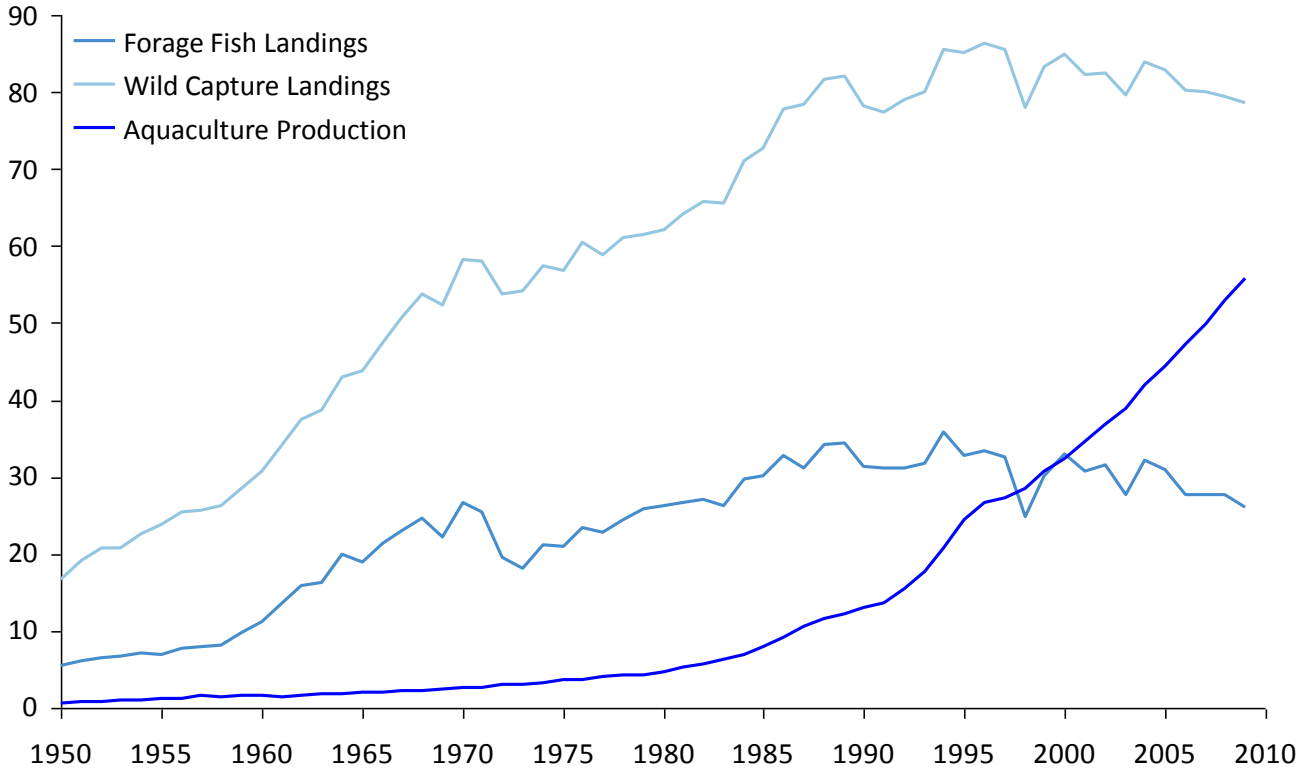
Smaller stocks and vulnerable species have not fared as well. Outside of major demersal and pelagic fisheries, the track record of stocks in middle income countries appears to be worrisome. Mexico, for example, has a diverse set of fisheries, managed through a combination of TACs, effort controls, and community-based fisheries management (CBFM). Officially, an astounding 80% of stocks are at or near B_{MSY}, but these estimates are themselves based on poor data, often relying on catch trends.[17] A deeper look indicates that relatively resilient species (shrimp, squid, and small pelagics) appear to be reasonably healthy, while many finfish stocks are in mediocre health. Furthermore, the most vulnerable populations (grouper, sharks, totoaba) are in very bad shape. In Malaysia, fisheries have fared better than their immediate neighbors (Indonesia and the Philippines), but critical stocks (e.g., those of snappers and groupers) are not managed effectively with stock status believed to be declining. The abundance of small-scale fishermen across most of these countries has meant that coastal fisheries are often under major pressure, which is poorly documented and difficult to control. In some cases, strong community-based fishery management systems have proven effective for sessile resources. Chile, for example, has implemented numerous territorial use rights in fisheries (TURFs) for its coastal fisheries, while Mexico has effectively used concessions to manage local lobster and abalone populations. But, poor documentation and variability across these smaller fisheries makes it difficult to generalize about their health.

[16] Excluding anchoveta

[17] Confidential Interview

Figure 1-17

Landings of species commonly used for reduction have been steady for the last 25 years, despite continued growth in aquaculture production



Source – FAO FISHSTAT
Notes – Aquaculture excludes plants; wild capture excludes higher order ISSCAAP groups; forage fish includes ISSCAAP group of herrings, sardines, anchovies and the following species: jack mackerel, Chilean jack mackerel, chub mackerel, jumbo flying squid, Atlantic mackerel, capelin, blue whiting, sand eel, Norway pout, krill, sprat, miscellaneous horse and jack mackerel

Box 1: Aquaculture

This study is focused on the ecological impacts of overfishing and recommendations for how the conservation community can address these challenges. The scope of the study did not include fish farming, but we recognize that aquaculture is closely interrelated with wild capture fisheries.

First, aquaculture recently passed wild fisheries as the main source of global seafood. Future increases in fish supply are likely to come primarily from fish farming. Many have suggested that aquaculture may be a way to alleviate pressure on wild-capture stocks. While we do not think that aquaculture will displace wild capture production, it may reduce the escalation in prices for several commodities (e.g. shrimp or marine finfish), thereby potentially serving as a release valve for pressure on poorly managed wild capture stocks.

Second, and conversely, many cultivated fish are fed wild fish in the form of fish meal and fish oil as part of their diet. Collectively, farmed fish consume more than two-thirds of global fish meal and nearly ninety percent of fish oil production, or the equivalent of 16M metric tons of small-pelagic fish every year.[18] Since the early 1990s, the global production of aquafeeds has grown substantially, and aquaculture has displaced other sectors that traditionally purchased the majority of fishmeal and fishoil, such as livestock and pig feeds. Over this period, global landings of small pelagic fish have remained relatively constant[19] suggesting that fish farming isn't driving huge increases in pressure on these stocks. The increased demand has, however, led to an increase in prices for fishmeal and fishoil,[20] which may provide economic incentive to expand fishing pressure to economically marginal fisheries (e.g. krill) or redirect fish from human consumption to reduction.

Third, marine fish farming can have direct impact on specific wild fish populations through a variety of vectors including the transfer of disease and parasites (e.g. infectious salmon anemia and sea lice), escapements that alter the gene pool of wild populations (Atlantic salmon in Europe), destruction of essential fish habitat (shrimp farming and mangroves), and the collection of fry or juvenile fish to seed farms or ranches (eels or blue fin tuna). In general, aquaculture and ranching are not known to be having systemic effects on the health of marine fisheries, apart from a handful of specific flashpoints such as Atlantic salmon, European eels, and bluefin tuna.

Fourth, farmed fish and wild fish interact directly in the marketplace. A recent pillar of the conservation community's work on fisheries has been the engagement of consumers, retailers, and other actors in the supply chain interested in sustainable seafood. The market is interested in solutions that apply equally to farmed fish and wild fish. The same tools that have been developed to support work on wild fisheries (consumer education tools, buying guides, rating systems, certification, improvement projects) have also been put together to cover aquaculture. These two sets of tools work best to the extent they are well integrated across farmed and wild fish.

Ultimately, this report does not offer any specific recommendations around the future of aquaculture. We recognize that the interrelations between fish farming and wild fisheries are critically important, but that a separate analysis of the future of aquaculture development would be required to make sweeping recommendations.

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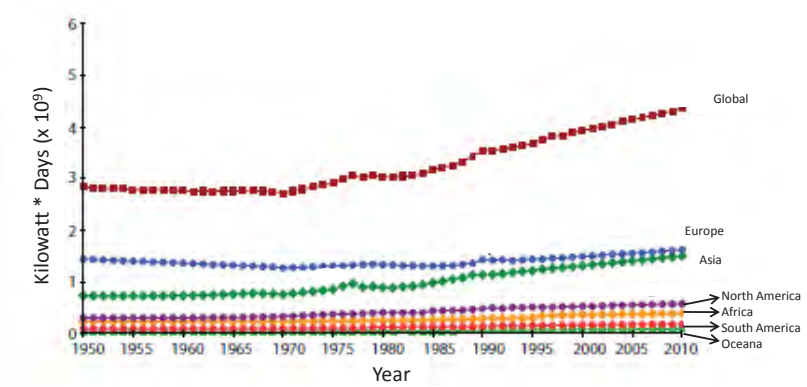
[18] Tacon, A., Metian, M. Global overview on the use of fish meal and fish oil in industrially compounded aquafeeds: Trends and future prospects. Aquaculture 285 (2008) 146–158

[19] FAO FISHSTAT

[20] Tacon, A., Metian, M. Global overview on the use of fish meal and fish oil in industrially compounded aquafeeds: Trends and future prospects. Aquaculture 285 (2008) 146–158

Figure 1-18a

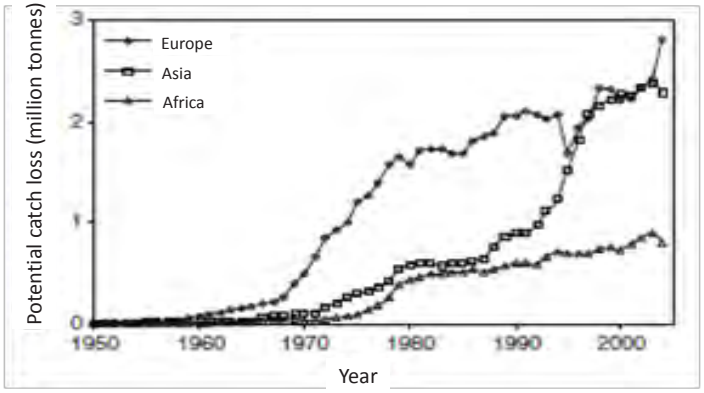
Asia shows greatest increase in fishing efforts; Asian fisheries are operating below optimum productivity



Source: Anticamara, J.A., et al, 2010; Global fishing effort (1950-2010): Trends; gaps; and implications, Fisheries Research
Srinivasan, Thara, 2010. Food security implications of global marine catch lossesdue to overfishing, Journal of Bioeconomics

Figure 1-18b

Asia shows greatest increase in fishing efforts; Asian fisheries are operating below optimum productivity

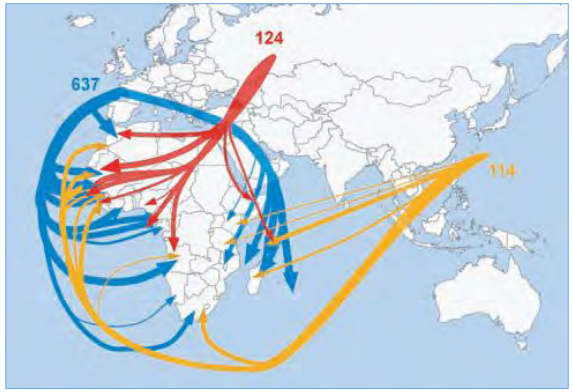


Source: Anticamara, J.A., et al, 2010; Global fishing effort (1950-2010): Trends; gaps; and implications, Fisheries Research
Srinivasan, Thara, 2010. Food security implications of global marine catch lossesdue to overfishing, Journal of Bioeconomics

Figure 1-19

Distant water fishing, and increasing domestic pressure will drive a fishery crisis in Africa in the future

Total fishing years in FAA in the 1990s



With overcapacity and underperforming stocks in their own fisheries, Europe and Asia will outsource more fishing effort to Africa.

Europe is now moving to improve its "external fleet" policy, fishing only on healthy stocks

Source: Worm , Boris, et al. Rebuilding Global Fisheries. Science 325, 578 (2009)

CHAPTER 1: THE STATUS OF GLOBAL FISHERIES

Argument 4:

Developing country fisheries appear to be seriously overexploited

Marine fisheries landings in lower middle income countries have grown by nearly 70% since 1988. [Figure 1-11] This trend masks a serious decline in the fundamentals of developing world fisheries. Rapid increase in fishing effort and targeting of new species have propped up total catch levels despite declines in ecosystem health. The combination of Malthusian overfishing and limited institutional capacity places the health of fisheries and marine ecosystems in these countries in grave danger.

Relentless expansion of fishing effort is pressuring developing world stocks. In Asia, effort has been increasing faster than in any other region of the world.[21] Fisheries are being serially depleted, and the economic rents are far below optimal. As effort continues to increase, Asian fisheries will soon surpass those of Europe as the most underperforming fisheries assets from a catch-weight perspective.[22] [Figures 1-18a,b] What is not clear is whether landings will continue to be maintained at current levels due to substitution of collapsed species with more productive "weed" species, or whether landings in the developing world will ultimately start to decline.

Southeast Asia is currently in serious trouble due to serial depletion, effort expansion, and ecosystem overfishing. Southeast Asia fisheries experts describe a dual problem. On the one hand, a steadily rising population is exerting ever stronger Malthusian pressure on near-shore stocks. These multi-species, hugely decentralized fisheries, featuring hundreds of thousands of vessels are essentially impossible to regulate with typical government-led initiatives. On the other hand, commercial fishermen of all kinds, ranging from $20 million tuna boats to primitive long-range squid boats, are taking their toll on offshore stocks, with most valuable fisheries in serious decline; this phenomenon has been masked in the landings numbers by the strong increase in the pursuit of highly productive "weed species" that are more capable of withstanding heavy fishing pressure on a year-over-year basis. A number of mobile commercial fleets also practice serial depletion geographically, moving ever further in search of high trophic-level catch. Even in remote areas such as West Papua, sharks and groupers are becoming increasingly rare.

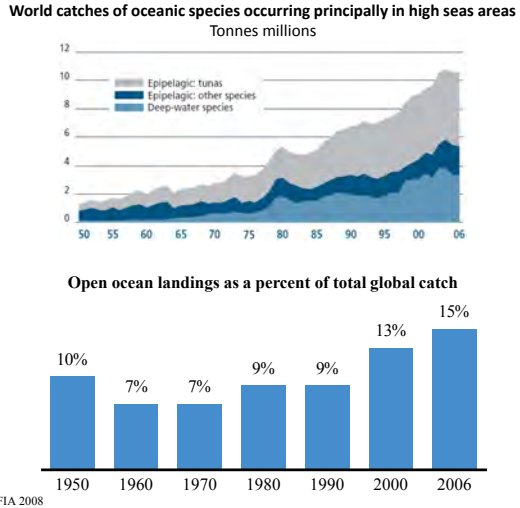
Central America and Africa are similarly challenged with weak management systems and increasing small-scale and industrial pressure. The situation in Africa, Central America, and the Indian Ocean appears to be following the same path. Small-scale fishing continues to grow as an employment of last resort, and management is generally open access. In much of Central America, fishery management institutions are frail, and operate mostly with limited control over industrial fleet permitting, and some gear and seasonal restrictions. Small-scale and subsistence fishermen are often undocumented and landings are poorly controlled. In Africa, the number of non-industrial fishermen continues to grow. The fisheries beyond the reach of small-scale fishermen are exploited largely by foreign fleets through fishery access agreements. In the 1990s, Europe and Asia exported large amounts of fishing capacity to Africa. [Figure 1-19] With overcapacity and underperforming stocks in their domestic fisheries, pressure from distant water fleets—particularly from Asia—will continue to grow. Despite the generally poor practices of these foreign fishing fleets, developing world countries continue to accept these agreements under the weight of political and economic pressure.

[21] Anticamara, J.A., Watson, R., Gelchu, A., Pauly, D. 2010. Global fishing effort (1950-2010): Trends; gaps; and implications, Fisheries Research, doi:10.1016/j.fishres.2010.10.016

[22] Thara Srinivasan, et al., 2010. Food security implications of global marine catch losses due to overfishing. Journal of Bioeconomics, 12: 183-200. DOI 10.1007/s10818-010-9090-9.

Figure 1-20

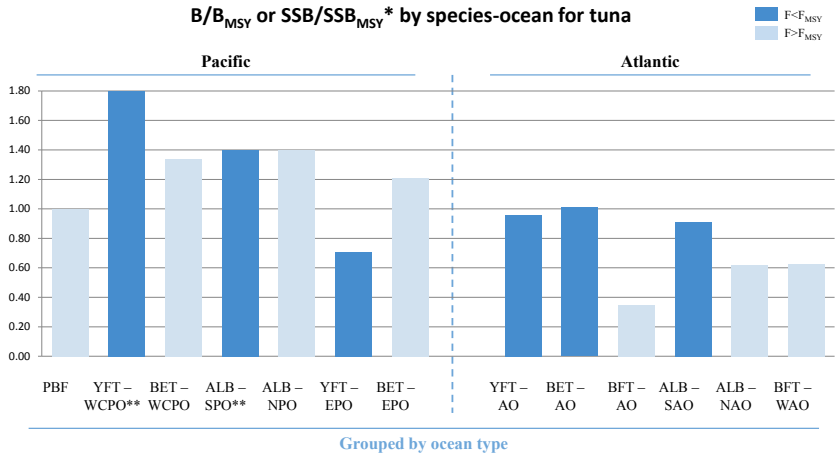
The share of global landings in the high seas increased from 7% in 1970 to 15% in 2006



Source: FAO FISHSTAT; SOFIA 2008

Figure 1-21

Many tuna stocks are overexploited, especially in the Atlantic



* SSB/SSB$_{MSY}$ was used as a proxy for the following species: YFT-IO; YFT-EPO; ALB-NPO; ALB-SAO; BFT-WAP; SBF; PBF-PO; BET-EPO; BET-IO
** These stocks are assumed to have a biomass greater than biomass MSY. The ratio of 1.4 is not the actual ratio of B/B$_{MSY}$ for these species

Source: Cullis-Suzuki, S.C. and D. Pauly. 2010. Failing the High Seas: A global evaluation of regional fishery management organizations. Marine Policy, 35(5): 1036-1042.

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Argument 5:

RFMOs are on the knife's edge

Open ocean stocks managed by UN-authorized RFMOs are in a precarious situation. The days where these stocks were spared by the high cost of open ocean fishing are over. Economically attractive species such as bluefin tuna have already been decimated, and fishing pressure on less economically attractive stocks like skipjack and albacore continues to increase. Due to consensus based decision-making structures, it may be difficult to limit fishing pressure to responsible levels. RFMO-managed tuna fisheries also have serious bycatch interactions with turtles, seabirds, sharks, and cetaceans. Without serious institutional reforms, the prognosis for the open ocean looks tenuous at best. [See Appendix 3 – RFMO Review]

The status of tuna stocks is mixed, but the trends are bad. In 2006, open ocean landings had increased to 15% of global catch, up from 7% in 1970. [Figure 1-20] Partly as a result of this increasing pressure, two-thirds of RFMO managed stocks are below B_{MSY}, or are being exploited above F_{MSY}.[23] RFMOs have a decidedly mixed track record: in the Atlantic, the majority of RFMO-managed tuna stocks have fishing mortality levels that either exceed F_{MSY} or are unknown, while in the Pacific, stock levels are generally at or above B_{MSY}, except for big-eye tuna and yellowfin tuna in the Eastern Pacific. [Figure 1-21] The over-exploitation of tuna has been most intensive for economically attractive (i.e., high priced) species such as bluefin tuna. Many open ocean stocks have been spared from overfishing in the past by the high costs of open-ocean fishing, and some of the largest stocks (e.g., skipjack) remain healthy, but pressure on these fish continues to rise. The RFMO's poor record of conservation and failure to set scientifically sound TACs makes the future of these stocks highly uncertain.

Ineffective management of bycatch is pushing certain species to extinction or collapse. With respect to bycatch, pelagic longline fisheries, typically managed by RFMOs, are a critical source of fishing mortality for vulnerable shark, seabird, and turtle populations.[24,25,26] Gillnet fisheries are also a serious contributor to bycatch in some regions, such as the Indian Ocean. The technical solutions to many bycatch problems are reasonably well known for seabirds and turtles (less so for sharks). For example, The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) has reduced seabird bycatch in demersal longline fisheries by 99% through a combination of mitigation measures.[27] Measures to reduce seabird bycatch in pelagic longline fisheries are improving, but lag behind demersal longline bycatch reduction techniques. Despite improving knowledge, RFMOs, in general, have been reluctant to implement and enforce mitigation measures that might impact catch rates or profitability, often despite clear evidence to the contrary. The result of this inaction has been widespread population declines, pushing threatened seabirds, turtles, and sharks closer to extinction or collapse. [See Chapter 1 – Argument 6 for more detail.]

[23] Cullis-Suzuki, S.C. and D. Pauly. 2010. Failing the High Seas: A global evaluation of regional fishery management organizations. Marine Policy, 35(5): 1036-1042.
[24] Gilman, E. 2011. Bycatch governance and best practice mitigation technology in global tuna fisheries. Marine Policy, 35(5): 590-609.
[25] Confidential Interview.
[26] Lewison, R. 2007. Putting Longline Bycatch of Sea Turtles into Perspective. Conservation Biology, Vol 21, No. 1, 79-86.
[27] Small, C.J. 2005. Regional Fisheries Management Organisations: their duties and performance in reducing bycatch of albatrosses and other species. Cambridge, UK: BirdLife International.

Figure 1-22

RFMOs have consistently rejected or deferred measures to reduce or improve enforcement of TACs

Proposal/scientific recommendation	Barriers/opposition	Outcome
NGOs recommended a TAC cut of 50% by ICCAT	Mediterranean fishing industry	**Rejected**. Reduced TAC by only 4%
Members propose the introduction of meaningful control and implementation measures as part of its proposal to extend the time-area closure for Bigeye tuna in the Gulf of Guinea		**Rejected** by ICCAT November 2010
Scientific committee recommended that TAC for Eastern Atlantic and Mediterranean bluefin tuna be set at F 0.1, or 8,500 tons or lower	France, Italy, Spain, Japan	**Rejected** by ICCAT November 2009. Set TAC at 13,500 tons
Canada proposed strengthening reporting measures for all commercial and recreational fisheries of Western Atlantic bluefin tuna	Most members	**Rejected** by ICCAT November 2009
Proposed measures to protect Eastern Pacific Bigeye tuna		**Rejected** by IATCC in 2007 and 2008**
IOTC Scientific Commission recommended a quota of 300,000 tons a year for Yellowfin tuna	Australia	**Rejected** by IOTC March 2010
Proposed Yellowfin tuna catch documentation scheme		**Rejected** by IOTC April 2009
Ban on discards of tuna by purse-seiners		**Rejected** by IOTC April 2009
WCPFC Scientific Committee recommends that there be a complete temporary closure to achieve an average of a 43% reduction in fishing effort on Bigeye tuna		**Rejected** by WCPFC December 2008

* Table contains selected examples of cases where RFMOs have failed to take action on proposals to reduce or improve enforcement of TACs
** Some measures adopted in 2009,

RFMOs often ignore science-based recommendations due to consensus decision-making structures. Rather than lack of data or capacity, the governance of RFMOs is the root issue at hand. RFMOs have frequently rejected or deferred the recommendations of their own scientific councils to reduce TAC and implement measures to protect vulnerable stocks. [Figure 1-22] RFMOs are mandated by the UN to "promote the equitable and efficient utilization of marine resources, the conservation of these resources, and the preservation of the marine environment," when in fact they are plagued by consensus decision-making processes where reform is continuously blocked by those countries who believe they would have to carry a disproportionate share of its costs. For example, in 2009, ICCAT's own scientific committee recommended that the maximum TAC for Eastern Atlantic and Mediterranean bluefin tuna be set at less than 15,000 tons with a recommended TAC of 8,500. ICCAT set the TAC at 13,500 tonnes, far higher than the recommended level of the committee. In the Southern bluefin tuna fishery, scientists recommended a fishery closure in 2009 as the only way to meet biomass recovery targets by 2025. This was rejected in favor of a mere 20% reduction, or a TAC of 9,450 tonnes. Members of RFMOs have also rejected efforts to protect bycatch species. Examples include Japan blocking measures to reduce dolphin bycatch, Spain rejecting circle hook requirements, and Mexico rejecting bans on sets on floating objects in areas with high concentrations of sharks, rays, and turtles.

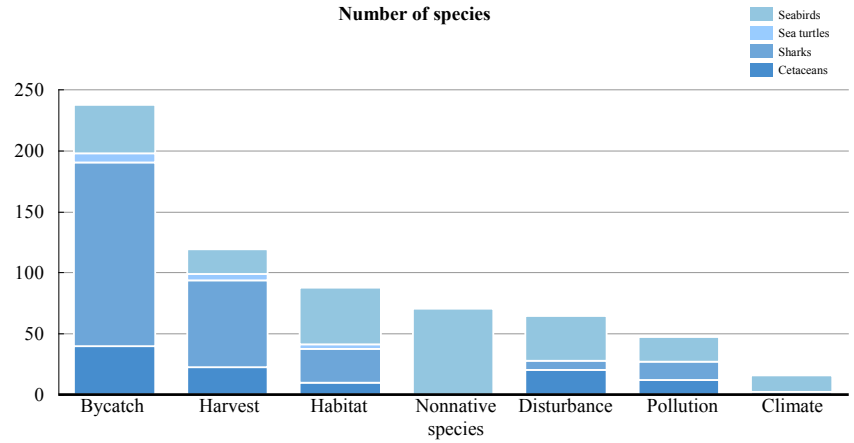
CCAMLR is an exception to the general rule of poor fisheries management in RFMOs. CCAMLR's founding objective is to conserve the Antarctic's living marine resources, and its mandates include keeping harvests at sustainable levels while accounting for the needs of dependent species. [See Appendix 4 – Ecosystem Based Fisheries Management] CCAMLR has implemented a number of conservation oriented measures and is often identified as perhaps the best managed RFMO.[28]

The root causes and dynamics of ineffective management within RFMOs are further delineated in Chapter 2 – Argument 3, and the details of the Atlantic bluefin tuna fishery are explored in Chapter 2 – Argument 2.

[28] Cullis-Suzuki, S.C. and D. Pauly. 2010. Failing the High Seas: A global evaluation of regional fishery management organizations. Marine Policy, 35(5): 1036-1042.

Figure 1-23

Bycatch and harvesting are primary threats for the most IUCN red listed marine species



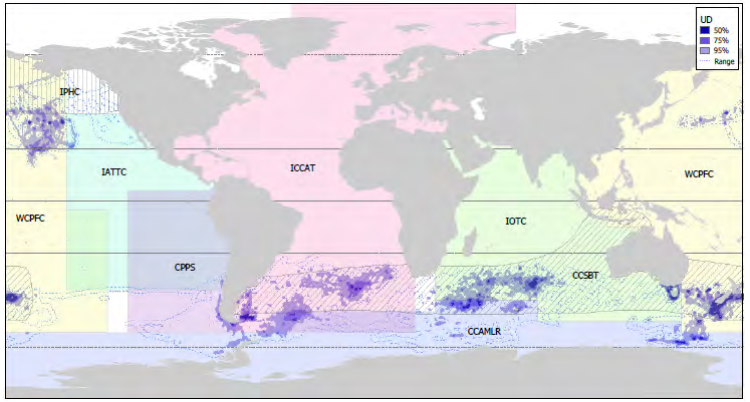
Total number of species of cetaceans, sharks, sea turtles, and seabirds in the IUCN red list database (http://www.iucnredlist.org/) affected by threat categories

Source: Finkelstein M., et al. (2008) Evaluating the Potential Effectiveness of Compensatory Mitigation Strategies for Marine Bycatch. PLoS ONE 3(6): e2480. doi:10.1371/journal.pone.0002480

Figure 1-24

The most dangerous fisheries for threatened seabirds are the open ocean longline fisheries in the Southern hemisphere

Distribution of threatened albatross species in relation to RFMO areas



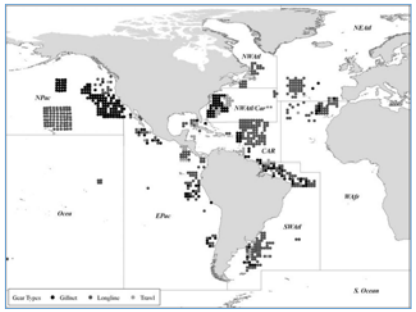
Utilization Distribution (UD) maps indicate how much time a species spends in a given area. In the map above, albatross spend 95% of their time within the light blue contour.

Source: Small, C.J. (2005), RFMOs: their duties and performance in reducing bycatch of albatrosses and other species. Cambridge, UK: BirdLife International

Figure 1-25a

Marine turtle bycatch is concentrated in trawls, longlines, and gillnets in the Mediterranean and eastern Pacific; gillnets and longlines in the southwest Atlantic; gillnets in the Indian Ocean; and longlines and trawls in the northwest Atlantic

Putative distribution of marine turtle bycatch records



Source: Wallace, et al. 2010, Global Patterns of Marine Turtle Bycatch. Conservation Letters, 3(3)

Figure 1-25b

Marine turtle bycatch is concentrated in trawls, longlines, and gillnets in the Mediterranean and eastern Pacific; gillnets and longlines in the southwest Atlantic; gillnets in the Indian Ocean; and longlines and trawls in the northwest Atlantic

Source: Wallace, et al. 2010, Global Patterns of Marine Turtle Bycatch. Conservation Letters, 3(3)

Argument 6:

Habitat and wildlife effects are a major issue in essentially all geographies

Bycatch, especially in open-ocean longline fisheries, continues to be a primary threat for many endangered marine wildlife species. [Figure 1-23] In addition to impacts on charismatic marine wildlife, bycatch also impacts non-target fish, invertebrates, and biogenic habitat.[29] Bycatch is a concern for both industrial and small-scale fishing operations.[30]

Seabirds. Of the 22 species of albatross, 17 are currently listed on the International Union for Conservation of Nature (IUCN) redlist, with bycatch listed as a primary threat for 12. The situation for petrels is similar.[31] The most dangerous fisheries for threatened seabirds include the open ocean longline fisheries in the southern hemisphere, coastal surface longline fisheries targeting several species in Southern Brazil, Uruguay, and Chile, and longline and trawl fisheries in Namibia and South Africa. [Figure 1-24] A large amount of seabird bycatch is also concentrated in demersal longline fisheries in the North Atlantic, but the seabirds affected by these fisheries are not the most threatened species. Solutions to seabird bycatch are well established, and include a combination of actions such as night setting, streamers, and increased line weighting; however, adoption and enforcement has been limited.

Turtles. The situation for turtles remains bleak. The IUCN classifies five of the seven species of marine turtles as endangered or critically endangered, with bycatch identified as a primary threat for most. The population for four of these species is declining while the trajectory of the other three species is unknown.[32] While the overall trends for turtle populations are poor, some battles are being won. The rapid growth of olive ridley populations in the Eastern Pacific over the last decade, and other successes may offer examples of what interventions are working. Fisheries most dangerous to turtles include shrimp trawls, longlines, and gillnets in the Mediterranean and Eastern Pacific; gillnets and longlines in the Southwest Atlantic; gillnets in the Indian Ocean, and longlines and trawls in the Northwest Atlantic.[33] [Figures1-25a,b] In addition to the impacts in these more industrial fisheries, there are significant turtle interactions in small-scale fisheries in Africa and Southeast Asia; the scale of this problem, however, is not well documented. Similar to seabirds, several management measures are known to be effective at reducing turtle bycatch, including the use of turtle excluder devices (TEDs) and circle hooks in select fisheries, but uptake has been limited. In Peru and Ecuador for example, just 10% of the coastal fleet is using circle hooks.[34]

[29] Shester, G.G., Micheli, F. Conservation challenges for small-scale fisheries: Bycatch and habitat impacts of traps and gillnets. Biol. Conserv. (2011), doi:10.1016/j.biocon.2011.02.023

[30] ibid

[31] International Union for the Conservation of Nature. 2010. IUCN website.

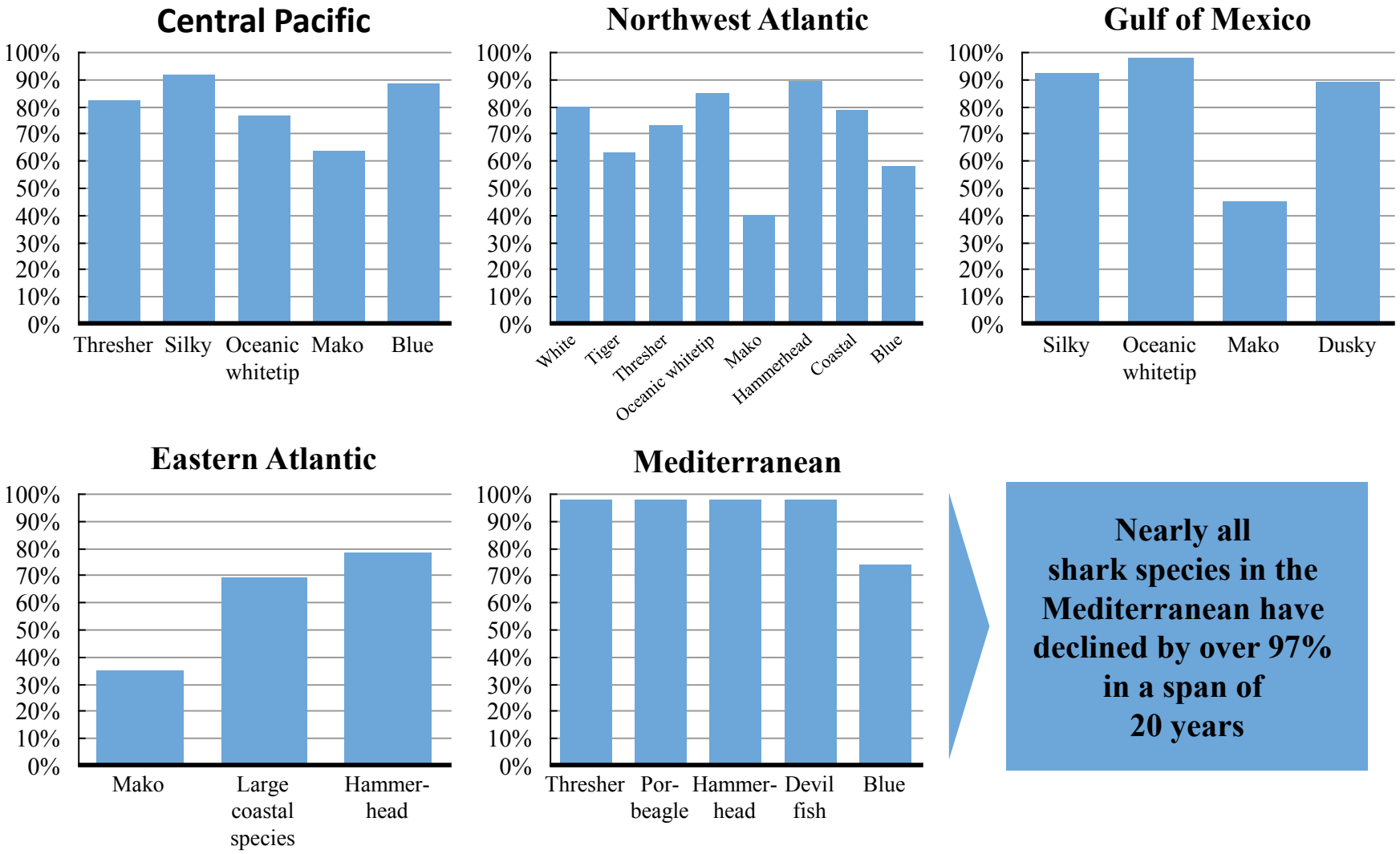
[32] ibid

[33] Wallace, B., R. Lewison, et al., 2010. Global Patterns of Marine Turtle Bycatch. Conservation Letters 3(4): 369.

[34] Confidential interview

Figure 1-26

Shark populations continue to decline globally – catastrophically in the Mediterranean



Source: Baum, et al. 2003. Collapse and Conservation of Shark Populations in the Northwest Atlantic. Science 299(5605): 389-392

Sharks. The status of sharks is equally dismal. For example, there have been declines in relative abundance of more than 75% for several species of shark in the Northwest Atlantic between 1986 and 2000.[35] In the Mediterranean, populations of nearly all shark species have declined by more than 97% during the last two decades. [Figure 1-26] Sharks can be heavily affected as bycatch in longline fisheries, and are also directly targeted in many fisheries. To put the scale of shark bycatch in perspective, the Atlantic Canadian Swordfish longline fishery catches and discards approximately 112 metric tons of IUCN listed blue sharks every year to catch approximately 1,000 metric tons of swordfish.[36] Unfortunately, tools such as circle hooks that are effective in reducing turtle and seabird bycatch are not effective in reducing shark bycatch, and so alternative regulations must be enacted to reduce shark mortality. Proposals include reducing the directed take of sharks, banning finning, setting bycatch limits for sharks in key fisheries, expanding observer programs, and establishing area closures for known shark nurseries and the high seas. Improved management of shark fisheries is also needed, although there is no clear institutional framework to manage shark fisheries that straddle the waters of multiple nations. Some have suggested that the UN fish stocks agreement may provide that framework, but implementation of the agreement has so far been insufficient to improve the management of sharks. The challenge of implementing measures to improve the health of shark populations is made more difficult due to the poor recording and reporting of shark bycatch. Even with all of those measures, it is unclear whether we will be effective at reversing current trends. While the impact of fisheries on sharks is more widely recognized, the status of skates and rays is of similar concern.

Marine Mammals. The picture for marine mammals is more mixed. Many populations of pinipeds and whales are recovering from previous declines, but fisheries interactions continue to threaten specific populations of marine mammals. Fixed and drift gillnets, purse seine, and trawl fisheries are the most dangerous fisheries for marine mammals, with small cetaceans (e.g., vaquita) often the most impacted.[37,38] Data on small cetacean populations are poor – 87% of species have unknown population trends – but all of the remaining 13% are declining in number.[39] Furthermore, species with small populations, like the North Atlantic right whale, are of particular concern as they are more vulnerable to bycatch mortality than species with larger populations.[40] There have been some successes at reducing mammal bycatch, notably the reduction in bycatch through restrictions on dolphin sets in tuna fisheries. Some fisheries have adopted or are experimenting with bycatch reduction technologies such as pingers, medina panels, and weak hooks, but adoption has been limited due to cost and implementation challenges.[41] Direct targeting of marine mammal species is probably lower than it was several decades ago,[42] but several directed hunts continue. This controversial practice has sparked

[35] Baum, et al. 2003. Collapse and Conservation of Shark Populations in the Northwest Atlantic. Science 299(5605): 389-392

[36] Moody, Intl., 2011. NW Atlantic Canadian Longline Swordfish: Public Comment Draft Report NW Atl Canadian Swordfish Longline PCDR_030111

[37] Read, Andrew, 2008. The Looming Crisis: Interactions Between Marine Mammals and Fisheries. Journal of Mammalogy, 89(3):541–548

[38] Lewison, Rebecca, et al. 2004. Understanding impacts of fisheries bycatch on marine megafauna. Trends in Ecology and Evolution. Vol. 19: No. 11

[39] IUCN Redlist, 2009.

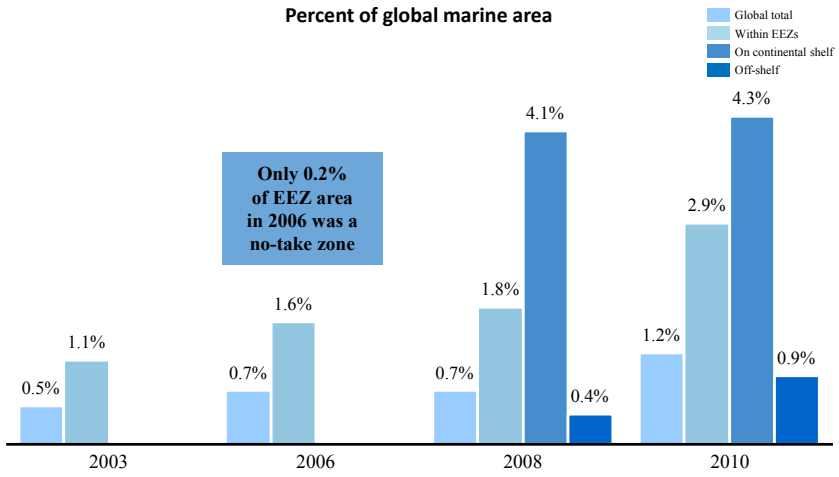
[40] Read, Andrew, 2008. The Looming Crisis: Interactions Between Marine Mammals and Fisheries. Journal of Mammalogy, 89(3):541–548

[41] Dawson, Steve, 2011. To Ping or Not to Ping? That is the question: A global review of the effectiveness of pingers in reducing gillnet bycatch of cetaceans. The Consortium for Wildlife Bycatch Reduction Workshop, October 2011.

[42] Robards, M., et al. 2011. The global extent and character of marine mammal consumption by humans: 1970–2009, Biological Conservation 144: 2770–2786

Figure 1-27

Only 1.2% of the ocean is covered by marine protected areas

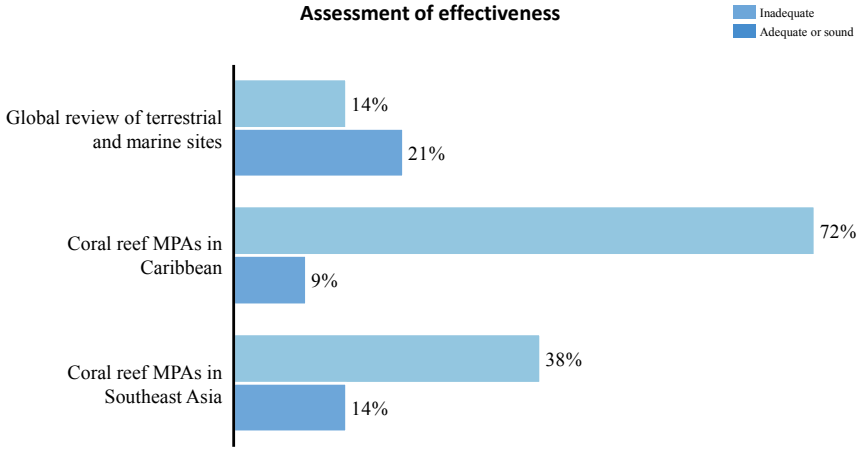


* No data for on and off-shelf areas before 2008

Source: Toropova, C. et al., Global Ocean Protection: Present Status and Future Possibilities, 2010. Halpern, Benjamin, Placing marine protected areas onto the ecosystem based management seascape, 2009

Figure 1-28

Many MPAs lack sufficient management and enforcement capacity



Source: Coral Reef Survey: Leverington et al., 2008; Global review: Burke et al. 2002; Burke and Maidens 2004

a heated battle between advocates for complete protection for marine mammals and those who support sustainable harvests. Although a great deal of attention is lavished on directed harvests, there has been an increase in the utilization of non-targeted cetaceans caught while fishing, much of which is been concentrated in countries with weak institutions.[43]

Habitat destruction. In addition to wildlife interactions, the impact of mobile fishing gear on benthic habitats is of serious concern. The extent of destructive fishing methods such as bottom trawling and dredging has not been well documented, but is believed to be ubiquitous. One of the few estimates put the extent of seafloor trawled annually at 15 million square kilometers, or 1.5 times the area of the U.S.[44] The impacts of this habitat alteration on overall ecosystem function and fisheries productivity are among the most poorly understood of the important environmental effects of fishing, but are believed to have serious consequences for marine biodiversity and ecosystem health. Recognizing the need to protect parts of the ocean from the destructive impacts of fishing[45] and other uses, commitments were made at the Convention on Biological Diversity to conserve at least 10% of the ocean. Unfortunately, progress towards this goal has been slow with just 1.2% of the ocean covered by MPAs.[45] [Figure 1-27] In reality, this 1.2% overestimates the area of ocean under protection as many MPAs lack sufficient management and enforcement capacity, and are little more than "paper parks". [Figure 1-28] A few countries and RFMOs have taken steps to protect marine habitat, through the establishment of no-trawl zones (e.g., the NPFMC, OSPAR, New Zealand), but similarly these actions do not collectively cover a large fraction of global shelf and slope habitats. Protection is also advancing in the high seas with recent successes including freezing the footprint of bottom trawling in the Pacific, banning bottom trawling in the Southern Ocean, and several RFMOs (NAFO, NEAFC, SEAFO) closing biologically diverse ecosystems in the Atlantic. [See Appendix 4 – Ecosystem Based Fishery Management]

[43] ibid

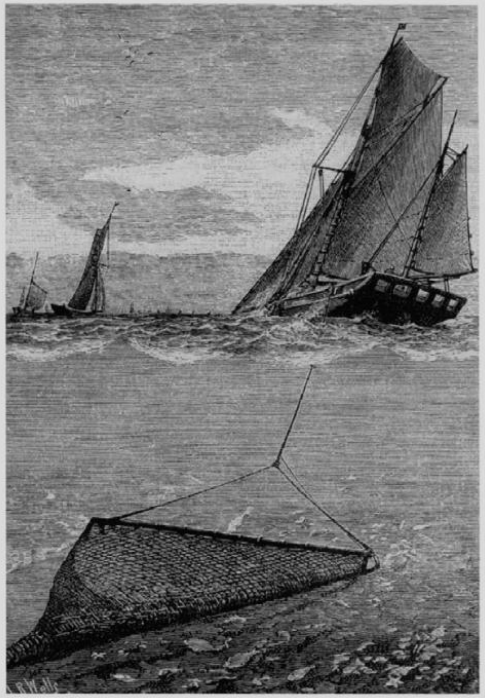
[44] Watling, L., and E. Norse. 1998. Disturbance of the Seabed by Mobile Fishing Gear. Conservation Biology, 12(6): 1180-1197.

[45] Committee on Fisheries, Ocean Studies Board. 1994. Improving the management of U.S. marine fisheries. U.S. National Research Council. Washington, DC.

[46] Toropova, C., Meliane, I., Laffoley, D., Matthews, E. and Spalding, M. (eds.) (2010). Global Ocean Protection: Present Status and Future Possibilities. Brest, France: Agence des aires marines protégées, Gland, Switzerland, Washington, DC and New York, USA: IUCN WCPA, Cambridge, UK

Figure 1-29

Trawling began in the 13th century



Beam trawls consist of a bag net held open by a wooden or steel beam. They were invented in fourteenth-century England and were towed by sailing boats until the late nineteenth century when steam power was introduced. Source: Collins, J.W. (1889) The Beam Trawl Fishery of Great Britain with Notes on Beam Trawling in Other European Countries. *Government Printing Office, Washington, DC.*

Source – Roberts, C.M., 2007. The Unnatural History of the Sea. Island Press, Washington, D.C. Chapter 10.
Grace, Roger. 2004. Greenpeace.

Box 2: Habitat Impacts of Bottom Tending Gear

This report is focused primarily on the issue of overfishing. However, we clearly recognize that one of the most significant ecological effects of modern fishing is the impact of gear on the seafloor. Globally, fisheries disturb huge swaths of the ocean floor through the use of bottom-tending gears, particularly bottom trawls, but also dredges, pots, gillnets, and other gear. There is very poor data on the overall extent of this disturbance. Trawling has been employed as a fishing method since the 1300s, and its use has expanded dramatically over the last century with the emergence of improved gear, lighter nets, and more powerful engines. By one estimate, approximately 15 million square kilometers of the ocean are trawled annually,[47] an area fifty percent larger than the land area of the United States. As one expert summarized, "I think [a good rule of thumb is that] probably everywhere that is fishable and has fish is being trawled."[48]

A handful of studies have attempted to document the impact of trawling on benthic communities. The general consensus is that: 1) Trawling reduces bottom habitat complexity by leveling physical structures, 2) Repeated trawling results in discernible changes in the composition of benthic communities, 3) Trawling reduces the productivity of benthic habitats, 4) Fauna that live in low natural disturbance habitats are more susceptible to trawling (e.g. deepwater corals), and 5) Trawling can alter nutrient cycling and increase susceptibility to other stressors.[49]

Despite these general findings, it remains difficult to characterize the cumulative effects of bottom trawling on overall ecosystem structure or fishery productivity. In some cases, trawling may even increase the ecosystem biodiversity or the productivity of particular stocks. Documenting the site-specific impacts of trawling is complicated by many factors such as the natural fluctuations of species, changing environmental conditions, variable recovery times, and other sources of disturbance.[50] Understanding how these impacts scale across the broader ecosystem through trophic cascades is an even more difficult task.

Despite the unknowns, it's clear that trawling is having non-trivial effects on the majority of the world's continental shelves and slopes. As one expert said, "We don't know – there is an absence of information, but every study we do suggests that there is a problem. The terrestrial analogy might be that you're blind and you can't smell, but the forest all around you is burning and you're starting to feel the heat in your own home. It is not clear that managing fish stocks is sufficient to manage biodiversity."

Although progress toward ending overfishing is being made in many parts of the world, widespread habitat protections are less common. To limit the impact of fisheries on habitat, managers rely on complementary tools including no-take zones, no-trawl zones, and gear restrictions, but implementation of these rules is spotty. For example, approximately 4% of the world's continental shelf area is in marine protected areas, but just a small portion of those MPAs are no-take marine reserves.[51] We have no data on what share of global waters are designated as no-trawl zones. Other fishery management approaches (e.g. TACs, limited access systems, and ITQs), may reduce overall effort, but don't necessarily reduce habitat impacts,[52] particularly given that the first pass of a trawl can be the most damaging.

Unlike restoring fisheries to MSY, it is often unclear whether there are sufficient economic benefits to the fishing industry to cover the costs from closing fishing grounds or mandating gear restrictions. This makes it difficult to justify the protections on a net-present-value basis alone. Despite this uncertainty, habitat protections are advancing around the globe. In the United States, numerous areas of essential fish habitat have been designated, a network of no-trawl zones have been implemented in the North Pacific, and some states such as California and Washington have banned trawling in their waters. New Zealand has banned trawling on numerous seamounts within its EEZ, and CCAMLR has banned bottom trawling within the Southern Ocean. These examples highlight the progress that is being made on protecting habitat from the impacts of bottom tending gear, but much more work needs to be done.

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[47] Watling, Les, et al. 1998. Disturbance of the Seabed by Mobile Fishing Gear: A Comparison to Forest Clearcutting. Conservation Biology, vol. 12: No. 6

[48] Confidential expert interview

[49] National Research Council, 2002. Effects of Trawling and Dredging on Seafloor Habitat. National Academy Press, Washington, D.C.

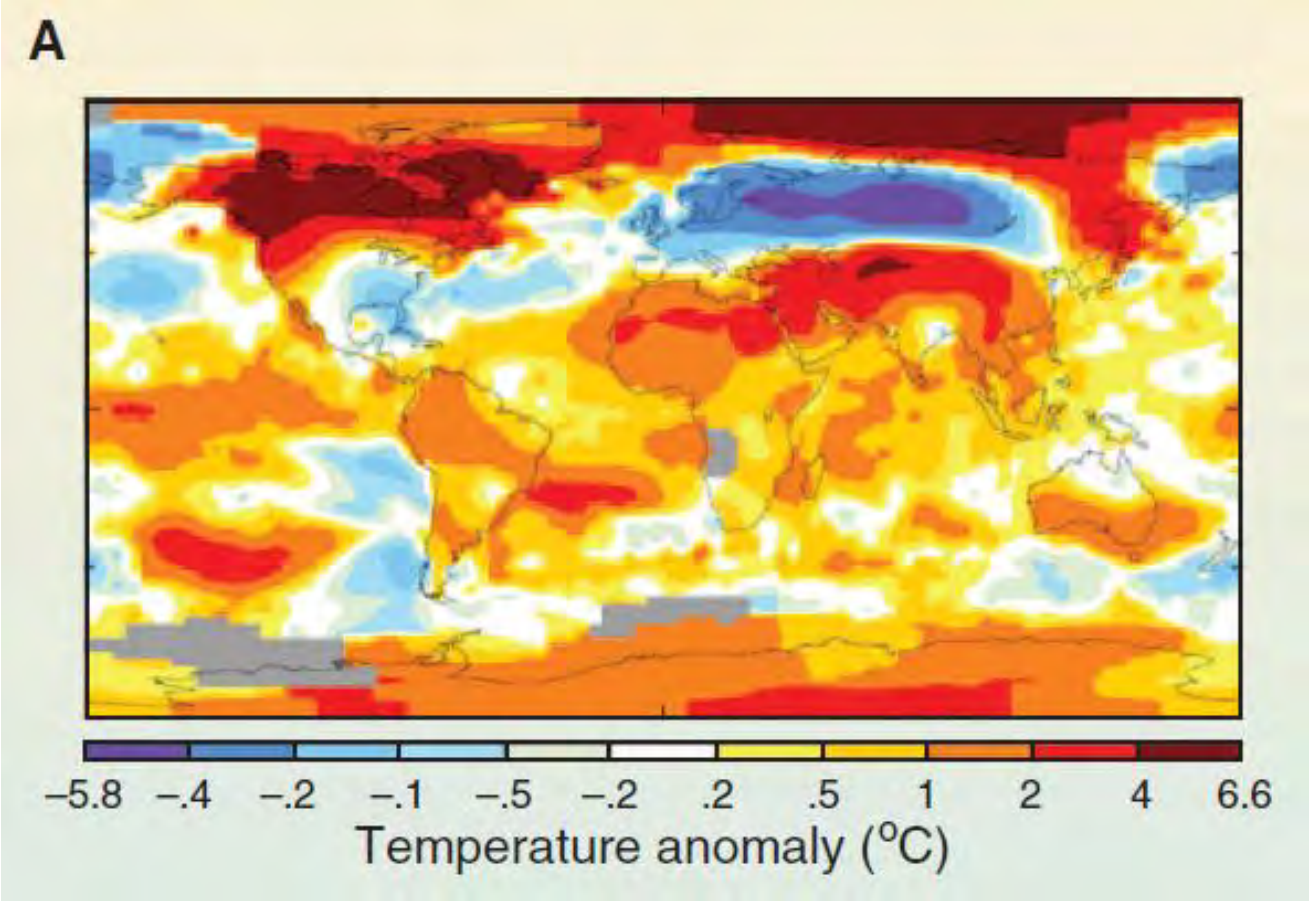
[50] ibid

[51] Toropova, Meliane, et al. Global Ocean Protection: Present Status and Future Possibilities. Brest, France: Agence des aires marines protégées, Gland, Switzerland, Washington, DC and New York, USA: IUCN WCPA, Cambridge, UK : UNEP-WCMC, Arlington, USA: TNC, Tokyo, Japan: UNU, New York, USA: WCS. 96pp.

[52] Branch, Trevor, 2009, How do Individual Transferable Quotas Affect Marine Ecosystems? Fish and Fisheries, 10, 39-57.

Figure 1-30

Ocean temperature anomaly in January 2010 compared to average between 1951-1980



Source – Hoegh-Guldberg, Ove, 2010. The Impact of Climate Change on the World's Marine Ecosystems. Science, Vol.328

Box 3: Climate Change

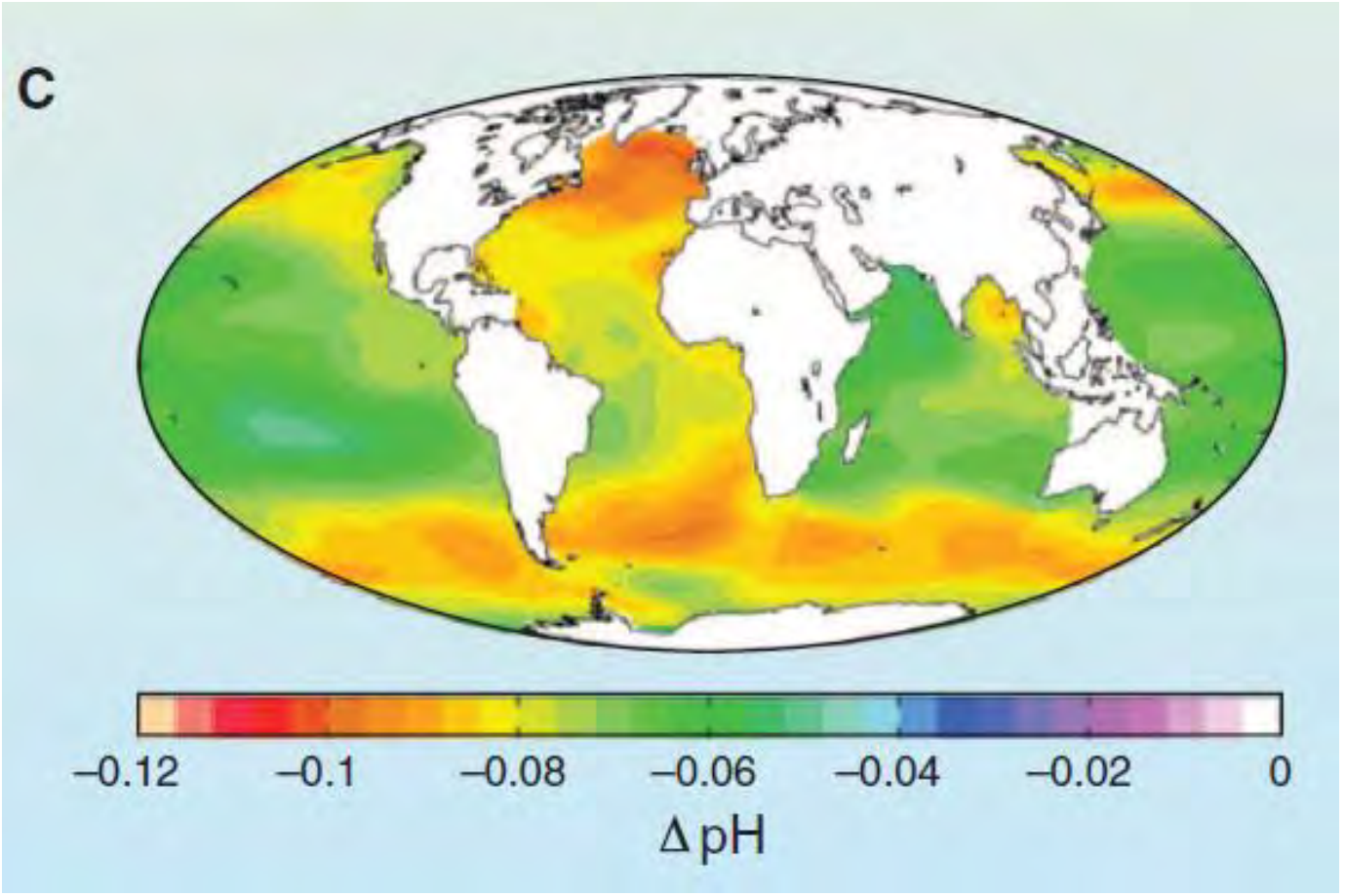
Climate change is a critical issue for the future of global fisheries. The scope of this report did not include a thorough analysis of the effects of climate change (nor do we look at pollution, coastal development, shipping, oil and gas, etc.), but we recognize that climate is of paramount importance for the future of marine fisheries. As on land, rapid changes in the marine environment are already underway, and will inevitably impact the biodiversity, abundance, and resilience of marine ecosystems. Rising concentrations of greenhouse gases in the earth's atmosphere are driving myriad changes in the ocean, including:

- Over the last hundred years, the temperature of the upper layers of the ocean has risen by an average of 0.6 degrees Celsius,[53] and is expected to increase approximately 1.6 degrees Celsius by 2100.[54] In response to changing temperatures, species distributions are already changing, typically with pole-ward migrations.
- The rise in sea surface temperatures and melting glaciers are both contributing to sea level rise, expected to be in the range of 0.5 to 1.4 meters by 2100.[55] Sea level rise threatens to inundate and destroy valuable estuarine habitats, particularly where human infrastructure prevents coastal retreat.
- Increased sea temperatures are degrading the integrity of coral reefs through disease and coral bleaching events. These episodes have grown more frequent over the past few decades, with the worst known bleaching event killing more than 16% of the world's corals.[56]
- Changes in sea surface temperature are also believed to be driving increased stratification, which can inhibit the delivery of nutrient rich deep waters to surface waters and reduce primary production – a cornerstone of ecosystem structure.
- Furthermore, the absorption of CO_2 is steadily reducing the pH of the ocean resulting in lower concentration of carbonate ions in the water.[57] These carbonate ions are critical to the development of many marine species, with molluscs, corals, and other calcifying organisms the most severely impacted.[58] Ocean acidification has already been implicated as the cause of oyster die offs on the Oregon and Washington coasts.[59]
- Although more poorly understood, there is concern that climate change may impact the strength and frequency of storms as well as oceanic climate oscillations like the El Nino Southern Oscillation and the Pacific Decadal Oscillation. While researchers have yet to develop models of sufficient resolution to predict how climate change will impact these systems, there is little doubt that climate change will alter the physical processes that determine their variability.[60] Changes in the variability of these ocean systems will likely have major impacts on the oceans, as they alter ocean currents, sea surface temperatures, and, in turn, ocean population.

[53] Ove Hoegh-Guldberg, et al. The Impact of Climate Change on the World's Marine Ecosystems. Science 328, 1523 (2010)
[54] Gruber, Nicolas, 2011. Warming up, turning sour, losing breath: ocean biogeochemistry under global change. The Royal Society. Vol. 369: 1980-1996. doi: 10.1098/rsta.2011.0003
[55] Rahmstorf, Stefan, 2007. A Semi-Empirical Approach to Projecting Future Sea-Level Rise. Science. Vol. 315
[56] Hughes, T.P., et al. Climate Change, Human Impacts, and the Resilience of Coral Reefs. Science 301, 929 (2003)
[57] Ove Hoegh-Guldberg, et al. The Impact of Climate Change on the World's Marine Ecosystems. Science 328, 1523 (2010)
[58] Fabry, V.J., B.A. Seibel, R.A. Feely, and J.C. Orr. 2008. Impacts of ocean acidification on marine fauna and ecosystem processes. ICES Journal of Marine Science 65: 414-432
[59] Kaufman, Leslie, 2012. Study Links Raised Carbon Dioxide Levels to Oyster Die-Offs. New York Times, April 12th, 2012
[60] Collins, Mat et al.2010. The impact of global warming on the tropical Pacific Ocean and El Niño. Nature Geoscience. DOI: 10.1038

Figure 1-31

Estimated change in ocean pH since the pre-industrial period



Source – Hoegh-Guldberg, Ove, 2010. The Impact of Climate Change on the World's Marine Ecosystems. Science, Vol.328

Box 3: Climate Change (continued)

The multitude of climate risks to the ocean environment is of grave concern, and the single most important action we can take is to halt the escalation of greenhouse gas concentrations in the atmosphere as quickly as possible. At the same time, these impending climate-driven impacts only elevate the importance of improving the health of our fishery resources. Ideally, fisheries management will take these shifting conditions into account when establishing target biomass levels and projections for non-target stocks. Reducing the stressors of overfishing and habitat damage should help to improve the resilience of the marine ecosystem to climate change. Best practices around the adaptive incorporation of environmental variables into fisheries management are only emerging now, and will become increasingly important over the coming decades.

CHAPTER 2: ROOT CAUSES AND SOLUTIONS

SUMMARY

Overall conclusion:

Although the solutions to overfishing are well known, the transition to sustainability is complicated by highly resilient economic and institutional barriers

Argument 1: Management solutions for every fishery archetype are known and well-documented. Effective fishery management is based on simple principles, such as the reduction of the fishery commons to an economically feasible number of users; the use of relevant information to limit mortality; and the prevention of dangerous negative externalities such as the destruction of habitat, wildlife, or broodstocks. The FAO Code of Conduct for Responsible Fisheries describes a broad consensus for such a responsible, ecosystem-based approach to fisheries management. For industrial fisheries, these principles are commonly implemented through scientifically guided decision-making frameworks (e.g., harvest control rules, rebuilding requirements, and long-term management plans) that set appropriate output controls (e.g., TACs or escapement targets) and are often optimized through the use of catch shares[61] or other forms of rights-based management. For multi-species coastal fisheries, especially in developing countries, this rigorous management approach is exceedingly difficult to enact. Instead, a combination of input controls (e.g., limited access, seasonal closures, gear restrictions) and community-based fishery management approaches have proven to be most effective, especially when they rely on appropriately mandated and scaled spatial management approaches such as integrated territorial use rights and protected area systems fisheries.

Argument 2: However, adoption of these solutions is effectively blocked by a combination of institutional weakness and powerful economic forces. Despite recognition of these principles, progress has been halting. Most nations lack effective fishery management institutions or community-based fishery management traditions and are largely incapable of imposing effective mortality controls. Weak management creates a vicious circle where individual fishermen are concerned about the dissipation of their future incomes, are compelled to rely on short-term yields, and see no economic reward for "good" behavior. With future landings ever more uncertain, today's catch is ever more important. This dynamic compounds the "race for fish" and inexorably erodes the biological and economic fundamentals of the fishery. In many cases, subsidies are introduced to improve these eroded economics, which further fuels the spiral toward excessive effort and collapse. Except for highly productive and resilient fisheries (e.g., anchoveta, shrimp), we can assume that economically viable fisheries without effective mortality controls are bound for overexploitation and, potentially, collapse. Even highly productive fisheries are likely to be overexploited, though they are less likely to collapse and recover more quickly.

This assessment documents three case studies in which the dynamics described above play out: Atlantic Bluefin Tuna, Gulf of Mexico Red Snapper, and Tropical Grouper. In the case of Eastern Atlantic and Mediterranean bluefin tuna, the inability of ICCAT to impose and enforce meaningful mortality restrictions has led to massive overcapacity throughout the bluefin tuna fishing industry. This overcapacity has created strong incentives for some fishermen to break the law in order to realize profits. In the case of the Gulf of Mexico Red Snapper fishery, a high volume of dead discards and overfishing in the recreational sector, driven in part by inappropriate management measures, have adversely affected all sectors of the fishery. In the case of tropical grouper, the biological characteristics of the stocks are such that even purely artisanal fishing is threatening the survival of the stocks, and large-scale commercial fishing will cause collapse in very short order.

[61] In this report, we will define "catch share" as a fishery management system that allocates a secure privilege to harvest a specified amount of a fishery's total allowable catch to an individual or group. The term includes a variety of different forms: individual transferable quotas (ITQs), individual fishing quotas (IFQs), cooperatives, community fishing quotas, territorial use right for fishing (TURFs) and more. Their central purpose is to solve the problem of the commons through clearly defined, exclusive property rights – in economic terms, they balance the use value (i.e. the value obtained from harvesting) against the asset value (i.e. the value fish in the sea, as defined by the future harvests) of a fish stock, conferring to the participants an assurance that a share of the fishery will be theirs into the future, without the infringement by others.

Argument 3: As a result, the transition to sustainable fishing is very difficult. Although current overfishing produces economic losses believed to be in excess of $50 billion per year,[62] these losses are not the results of irrational behavior—quite the opposite. Our inability to correct overfishing is based on three basic root causes: first, fishery restoration usually requires a reduction in fishing effort for some period of time, usually leading to short-term financial losses throughout the value chain. Those players who place a higher value on short-term profit may in fact prefer high short-term yields to the prevention of fishery collapse. Second, the economic costs and benefits of fishery restoration are not evenly distributed among the players; there are winners and losers. In a consensus-based decision-making system such as that used by the RFMOs, potential losers will attempt to block any reforms. Third, both fishery data and active management are usually necessary to achieve sustainable fishing. However, in many places, there are no means to organize and pay for these necessities. Without an indication of the health of the fish stock, even the fishers with the best intentions can overfish. Without effective management, the depletion of the shared resource is the likely outcome. Even assuming a politically feasible solution can be found, effective management can require a substantial up-front investment in a resource strapped environment. The infrastructure and operating costs of effective management (whether government led or community based) are rarely taken into account. The investment required for improved fishery management is greatest where the fishing crisis is most acute—in the coastal fisheries of developing countries. The Malthusian pressure in many developing nations makes coastal fishery management exceedingly difficult, and is further complicated by the challenges of illegal fishing, huge data deficiencies, and the lack of alternative livelihoods for fishermen. Because fishing is a livelihood of last resort in many communities, governments are often reluctant to close fishing opportunities to their citizens for fear of social problems.

[62] World Bank and FAO. 2009. The Sunken Billions. http://elibrary.worldbank.org/content/book/9780821377901

Figure 2-1

Evolution of basic fishery management solutions

	Developed countries	Developing countries
No management	• N/A	• No vessel registration system for commercial fishing • Weak or no enforcement of EEZ from DWFs • Legally mandated or effective open access for all fishers • No effective gear restrictions
Basic controls (no real mortality limits)	• Vessel registration and reporting requirements • Basic effort reduction measures (some combination of closed areas and/or closed seasons) • Gear restrictions on damaging gear types	• Industrial fishing: Same as developed countries • Coastal or small scale fishing: Essentially none, except some restrictions on damaging gear types
Intermediate controls (some prospects of mortality reduction)	• In addition: – Limited access (vessel/permit limits) – Gear restrictions that serve as effort limits (vessel size/horsepower, trawl size, mesh size, trap limits) – Effort controls (e.g. days-at-sea systems, fishery closures, tradable effort controls) – Basic bycatch reduction measures (TEDs, Nordmore grates)	• Industrial fishing: Same as developed countries • Coastal or small scale fishing communities – Legal basis for community-based marine tenure systems – Promotion of area-based CBFM for communities seeking control over fishing effort of sessile and semi-sessile species (TURF-Reserves, LMMAs, permisos, etc.)
Advanced controls (strong mortality control; EBFM)	• Harvest control rules or long-term management plan to create decision-making guidelines • TACs or escapement targets for major fisheries (i.e., output controls), supplemented by TACs for bycatch or weak stock species • Adaptive input controls for small-scale, data-deficient, and volatile fisheries • Catch share systems to improve economic incentives (e.g., ITQs, IVQs, CDQs, TURFs, quota pooling, etc.) • Permanent or rotating closed areas to accommodate spawning habitats and weak stocks (no take reserves and no trawl areas)	• Industrial fishing: Large closed areas, harvest control rules, and TACs • Community/coastal fishing: – Integrated, large-scale TURF-Reserve systems to cover pelagic species and more vulnerable finfish – Sophisticated CBFM practices

CHAPTER 2: ROOT CAUSES AND SOLUTIONS

Argument 1:

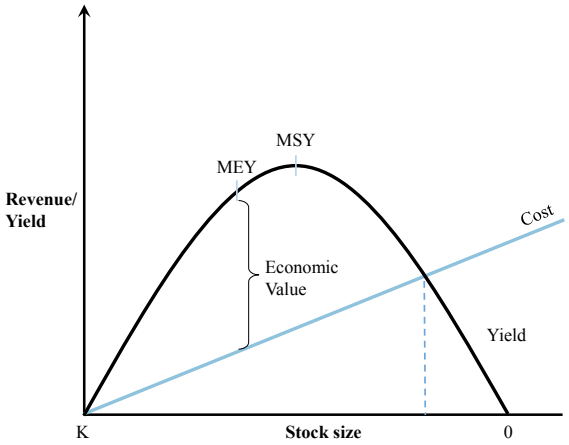
Management solutions for every type of fishery are known and well-documented

All effective fishery management systems are based on the same principles. These include the reduction of the fishery commons to an economically viable number of users; the reduction of mortality to a scientifically determined precautionary level;[63] the recognition of ecosystem impacts of fishing;[64] the empowerment of fishermen; and the prevention of dangerous externalities such as habitat, wildlife, and brood-stock destruction. These principles are broadly represented in the FAO's Code of Conduct for Responsible Fisheries (CCRF), and have been endorsed and expounded upon in many reports, including the Prince's International Sustainability Unit (PISU). However, the real world imposes constraints to the effective application of these management principles. In particular, the capacity, authority, mandate, and sophistication of the institutions responsible for fishery management diverge hugely among nations. As a recent symposium of ecosystem-based management (EBM) noted, "The greatest risk identified for many of the regions of the world is the lack of effective governance. Rectifying this central problem is a prerequisite for any form of sound fishery management."[65] Given this constraint, best practice in fishery management varies as a function of the institutional capacity.

Best practices in fishery management for regions with strong institutional management capacity. There is a basic evolution of fishery management solutions across global fisheries. [Figure 2-1] In the developed world, effective management is typically government mandated and led, with substantial input and co-management support from fishing communities. Even countries with a long tradition of community-based fishery management, such as Japan, rely on national legislation to authorize and guide these groups. At a minimum, almost all developed countries and industrial fisheries feature basic vessel registration, limited access, and monitoring requirements. These are fundamentals of management. In addition, most countries have some method to set catch targets, though these vary in their scientific rigor. More advanced systems set targets that typically limit the TAC to levels below maximum economic yield (MEY) or MSY. Escapement targets, minimum and maximum size limits (for species with low discard mortality rates), and sex selectivity (e.g., berried females) are other examples of useful output controls. Limits based on MEY are preferable, because MEY catch levels can reduce the risk of accidental overfishing, improve ecosystem health, and maximize profits.[66] (MEY is typically more precautionary than MSY). [Figure 2-2]

A fundamental difference among countries' management approaches is whether they seek to meet catch targets through input controls or outcome-based standards. A combination of gear restrictions and effort controls, seasonal controls, and in some cases bycatch reduction measures have been widely used. These input controls often do not prevent fishery collapse because fishermen can fully comply and still catch more than the targets. In addition, input controls can trigger a "race for fish" which increases fishermen's accident rate and decreases the economic value of the product.

Figure 2-2
MEY catch levels are more precautionary than MSY



[63] The FAO Code of Conduct for Responsible Fisheries calls for "measures which are designed to maintain or restore stocks at levels capable of producing maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing countries." It also calls for States to "apply the precautionary approach widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures."

[64] FAO Code of Conduct for Responsible Fisheries: "Management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species."

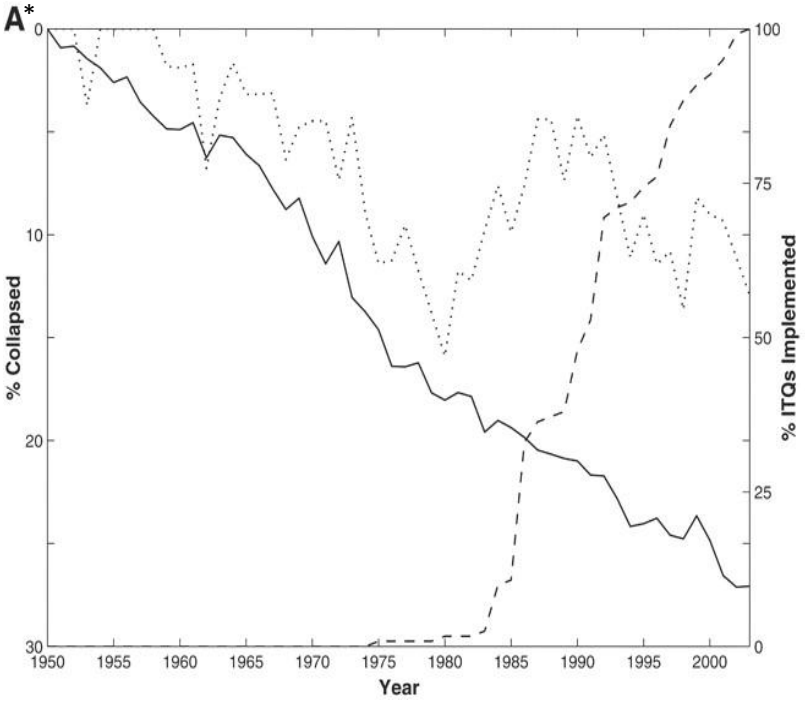
[65] http://seagrant.uaf.edu/conferences/2010/wakefield-ecosystems/index.php

[66] Although MEY is often difficult to define as it requires details on the cost of fishing, a basic precautionary limit such as 80% of MSY (Hilborn, R. 2009. Pretty Good Yield and exploited fisheries. Marine Policy 34(1): 193-196) can be used.

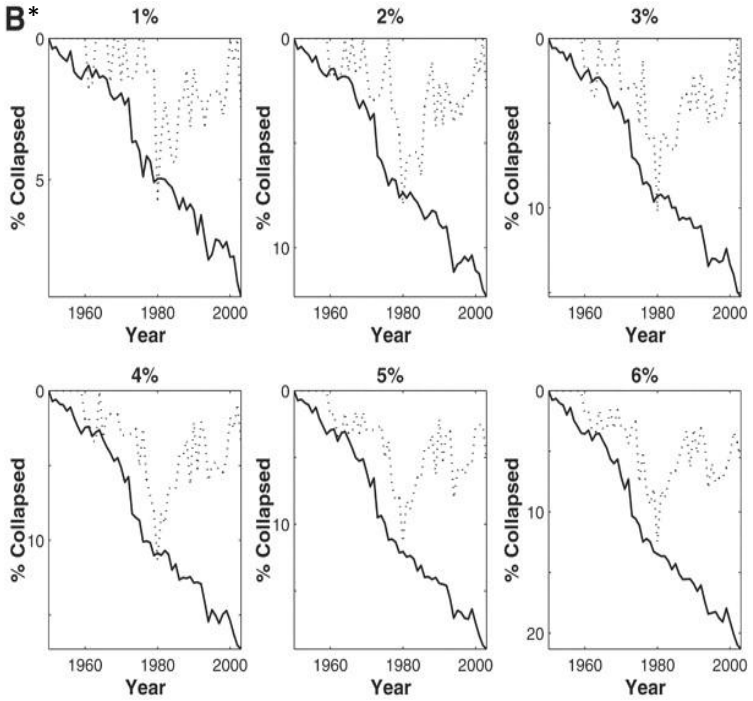
Figure 2-1

ITQ systems have consistently succeeded in preventing fishery collapse

Percent of fisheries collapsed with (dotted line) and without (solid line) ITQ



*Percent of fisheries collapsed with (dotted line) and without (solid line) ITQ management using the Worm et al. (6) collapse threshold (10% of historical maximum). The number of ITQ fisheries increases through time (right y axis and dashed line), and the rate of implementation has been accelerating.



*Percent of fisheries collapsed with (dotted line) and without (solid line) ITQ management using more conservative collapse thresholds: 1 to 6% of historical maximum catch.

Source: C. Costello et al., 2008; Can Catch Shares Prevent Fisheries Collapse? Science 321:1678-1681

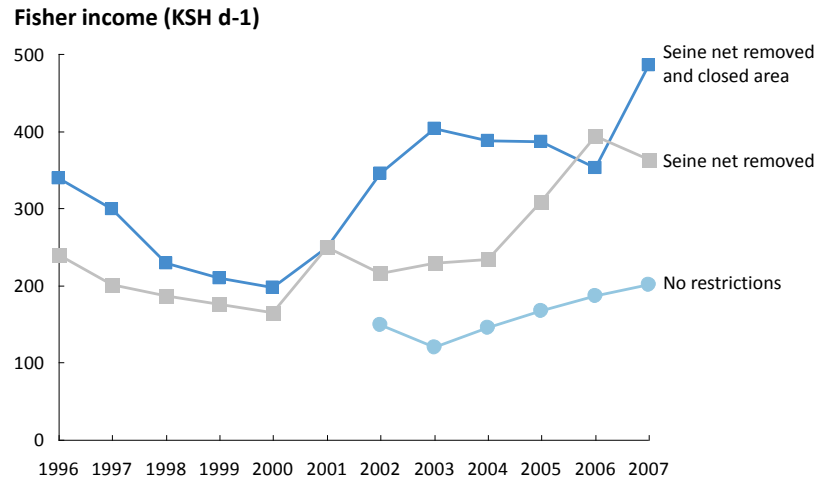
There is still some debate in the scientific community about the preference of output based controls. Dr. Sidney Holt, one of the fathers of the MSY concept, recently espoused that output controls should be secondary to input controls.[67] While that may be true in theory, the final conclusion of this analysis, drawing from interviews from around the world, is that in practice output-controls (e.g., TACs, escapement targets, bycatch limits, etc.) are least likely to be abused and to lead to overfishing. Empirical analyses indicate that fisheries with quota caps are overexploited less frequently than fisheries with input controls.[68] Similarly, the UCSB research of unassessed stocks found that the presence of a TAC is associated with higher biomass levels.[69] Output based controls are generally the preferred form of management for large, relative stable fisheries for which scientific stock assessments are feasible.

In terms of the specific design elements, performance-based control measures that set clear output-based standards and provide accountability and incentives for fishermen to meet those standards have been particularly effective. [Figure 2-1] In the most robust systems, the quotas under these limits are allocated under rights-based systems (catch shares),[70] which are intended to efficiently distribute the economic rents among stock "owners" or communities, and slow the race for fish. As one review summarized, "It is widely believed and supported by anecdotal evidence that once fishers have a financial stake in the returns from sensible investment in sustainable practices, they are more easily convinced to make sacrifices required to rebuild and sustain fisheries at high levels of economic and biological productivity."[71] The promotion of catch shares has been a common thread within the conservation community, though it is not without controversy. Rights-based systems have consistently succeeded in slowing fishery collapse, [Figure 2-3] because they provide fishermen with direct accountability and a compelling incentive to respect TACs, tend to consolidate and reduce the fleet, and align the economic well-being of the fishermen with the health of their stocks. If designed correctly, rights-based systems can also encourage fishermen to further optimize the health of the stocks by reducing overall effort and voluntarily closing critical habitat.[72,73] Despite the theory of rights-based management leading to improved health of fish stocks, catch shares are not a silver bullet. The empirical evidence has been mixed in some cases. Catch shares have been shown to reduce the variation in catch from target catch levels, and TAC overruns, though they don't necessarily result in increased biomass.[74] More importantly, catch share systems require very careful optimization of multiple design parameters such as quota allocation, quota concentration limits, treatment of spatially differentiated fisheries, and trading provisions. These design considerations need to balance the desired economic, biological, and social objectives of the fishery, and there are often inherent tradeoffs between them.

[67] Holt, Sidney, 2011. Rescuing Maximum Sustainable Yield. Breaching the Blue, Editorial. http://breachingblue.com/2011/11/07/rescuing-maximum-sustainable-yield/, Accessed May, 2012.
[68] Essington, et al. 2011. Can catch share fisheries better track management targets? Fish and Fisheries. DOI: 10.1111/j.1467–2979.2011.00429.x
[69] Costello, et al., In Press.
[70] Rights-based is used as a general term. These systems may be setup as dedicated access privilege systems and do not have to confer ownership of the public good to resource users.
[71] Sanchirico, et al. 2007. Global marine fisheries resources: status and prospects Int. J. Global Environ. Issues 7, 106
[72] Ovando, Dan. Spatial Use Rights and Marine Protected Areas in Fisheries Management. White Paper.
[73] Griffith, David. 2008. The ecological implications of individual fishing quotas and harvest cooperatives. Frontiers in Ecology and Environment; 6(4): 191–198
[74] Essington, et al. 2011. Can catch share fisheries better track management targets? Fish and Fisheries. DOI: 10.1111/j.1467–2979.2011.00429.x

Figure 2-4

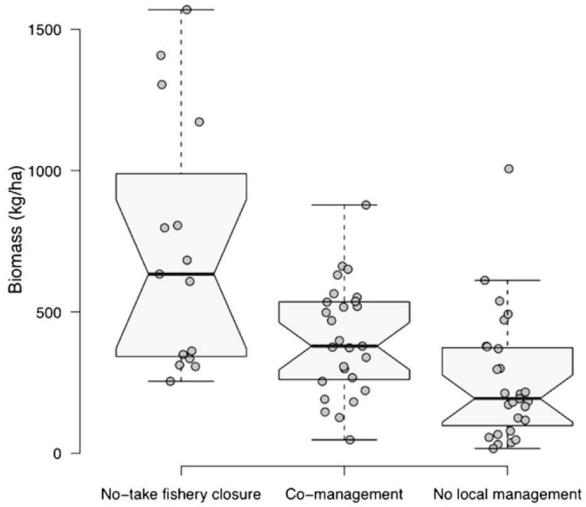
Simple gear restrictions have demonstrated the potential to improve the health of reef fish populations in developing countries



Source: Worm, Boris, et al., 2009. Rebuilding Global Fisheries. Science Vol. 325, 578.
McClannahan, et al., 2010. The Effects of Fisheries Closures and Gear Restrictions on Fishing Income in a Kenyan Coral Reef. Conservation Biology.Volume 24, Issue 6, December 2010, Pages: 1519–1528,

Figure 2-5

Fisheries under co-management systems have higher biomass than those with no local management



Source: Cinner, Joshua, et. al., 2012. Co-management of coral reef social-ecological systems. PNAS, vol 109: 14

Finally, there are many instances where there is not enough capacity (technical, analytical, etc.) to implement and manage performance-based control measures. In such instances, adaptive input control measures may be the best option. These measures adjust the level of fishing effort in response to changes on the water. They are most applicable to fisheries where the costs of output controls are considered too high (e.g., small scale or data deficient fisheries) or the natural resilience and volatility of stocks makes it difficult to set a TAC in advance (e.g., some squid fisheries). Adaptive input controls modify the level of effort in response to new (or real-time) changes on the water, flexibly adjusting fishing effort to the actual state of the stocks according to a pre-determined rule. Adaptive input controls can include limited access, seasonal closures, gear and area restrictions, days at sea restrictions, and vessel limitations or limits on the quantity of gear used by individual vessels. For example, New Zealand lobster fishermen shut down when catch per unit effort (CPUE) falls below a pre-set threshold. While these systems do not necessarily require full stock assessments of fishery independent data, they do require some sort of data to be useful such as CPUE, the size distribution of fish, or bycatch interactions.

Regardless of the decision on whether to use input or output measures, there are two overarching goals. The first is to reduce the fishery to an appropriately sized group of properly incented fishermen. The second is to depoliticize the annual catch or effort setting process through appropriate management guidelines. The two goals are deeply connected, since fishermen are far more likely to accept these management guidelines if they can be assured of their secure, long-term benefits. The creation of harvest control rules, mandatory rebuilding requirements, or long-term management plans, ideally combined with catch shares, are all mechanisms that help separate management decisions from annual allocation fights. These rules ought to be straight-forward and transparent, thus avoiding the black box, politically-charged TAC and effort setting processes.

Advanced fishery management systems also increasingly feature an array of protections for the broader ecosystem. EBFM includes protections for vulnerable marine wildlife populations, restrictions on the bycatch and discarding of non-target species (e.g., weak stocks), and greater protections for marine habitats, such as no-trawl areas, essential fish habitat designations, and marine protected areas. These management measures are essential complements to the management of direct target stocks to meet overall ecosystem objectives. Progress on EBFM has been most advanced in countries that have already addressed overfishing. [See Figure1-14] [See Appendix 4 – Ecosystem Based Fishery Management]

Best practice for developing country and small-scale coastal fisheries. For industrial fisheries, vessel licensing and permit limits, closed seasons, gear restrictions, and large closed areas are feasible in almost all parts of the world. However, in countries with weak management institutions, sophisticated output controls (TACs and catch shares) and responsive input controls rarely work, even when they are mandated by law. Often, there is too little information, capacity, money, and infrastructure to create and enforce the system. The lack of stock assessments and basic biological information frequently compound the challenge.

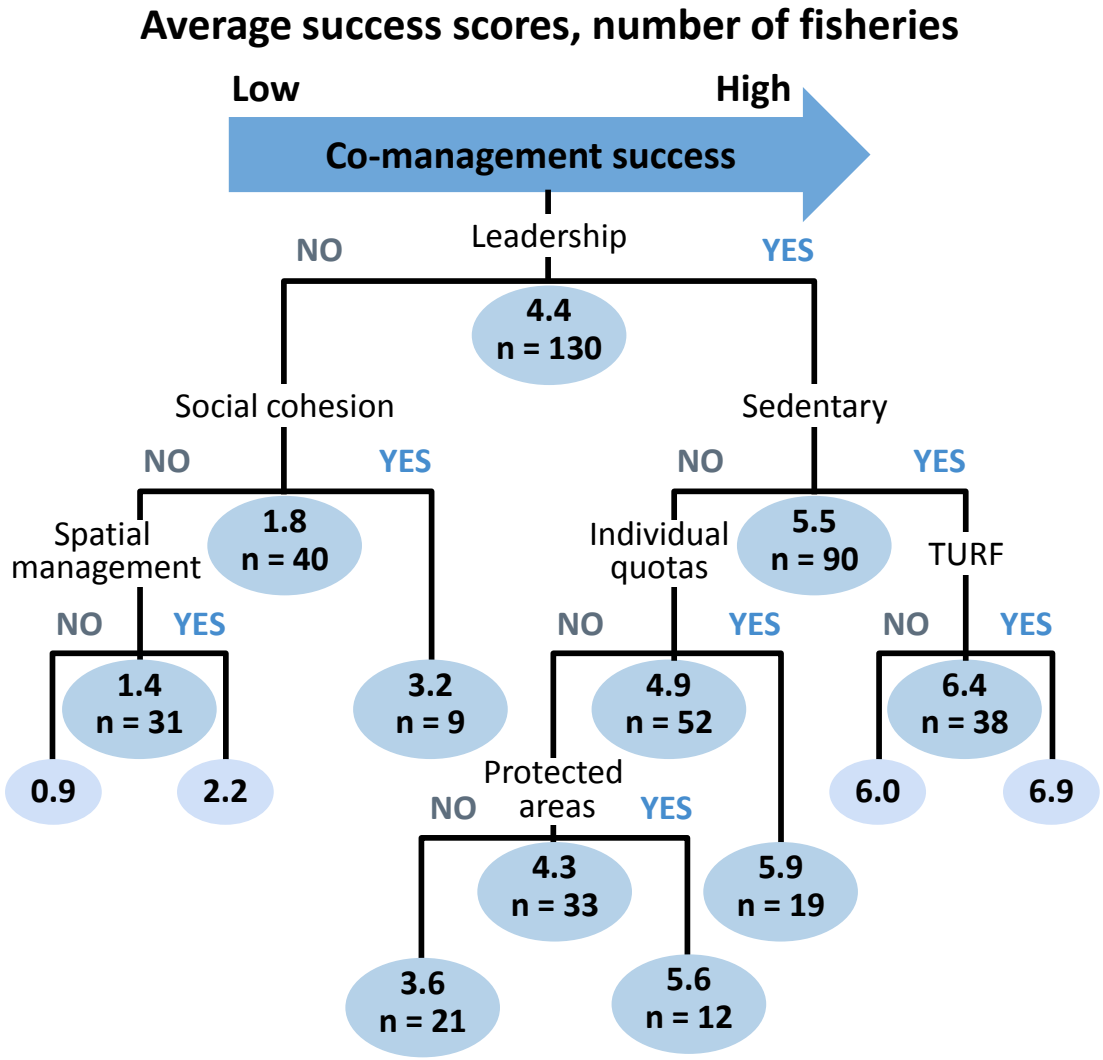
Small-scale, data-deficient fisheries thus require a very different approach, particularly in coastal areas of the developing world. In tropical regions these fisheries often include a great variety of species, a tremendous number of boats, and a wide variety of gear; are spread over many jurisdictions; lack stock data; and have limited institutional oversight and enforcement.

Creating enduring and effective fishery management systems for these types of fisheries is one of the most persistent challenges in global fisheries management. In the absence of effective centralized management, coastal communities need the legal right to assert tenure over their coastal shelf marine resources. (In many countries, this is not possible due to "open access" laws.) Once the legal right to assert tenure is granted, and proper guidance is given, a variety of co-management and cooperative approaches can be adopted (e.g., municipality limits on access, gear restrictions, creation of closed areas, and seasonal limits), which effectively close the fishery to outsiders, and provide local fishermen with the incentive to manage their stocks for long-term health and allow them to exclude outsiders. There are many examples, such as MPAs in Kenya, where such community-based action has been able to rebuild small-scale fisheries through closed area management and gear restrictions. [Figure 2-4] Similarly, tropical coral reef fisheries with co-management systems have higher biomass levels in target stocks than those with no local management.[75] [Figure 2-5]

[75] Cinner, J., et al., 2012. Comanagement of coral reef social-ecological systems. PNAS, vol. 109: 14.

Figure 2-6

Critical importance of community leaders



- Regression tree showing the most important factors determining success of coastal co-management systems
- Higher branches off greater explanatory power
- The tree explains 69% of total deviance

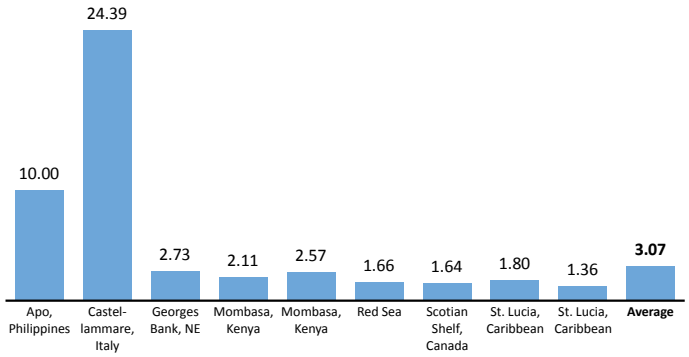
Source: Nicolas Gutierrez, et al. 2010. Leadership, social capital and incentives promote successful fisheries." Nature, 470: 386-389. doi: 10.1038/Nature 09689

Figure 2-7

MPAs have shown promise in their ability to increase CPUE outside MPAs

Ratio of CPUE Outside Reserve Before and After Reserve implementation (Fully Protected Reserves)

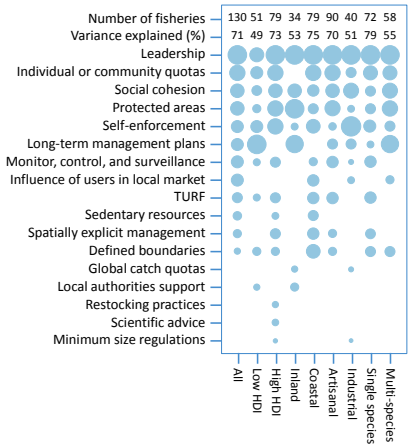
(1 = No Change)



Source: Worm et al., 2006 Impacts of Biodiversity Loss on Ocean Ecosystem Services

Figure 2-8

Critical importance of community leaders (continued)



Source: Nicolas Gutierrez, et al. 2010. Leadership, social capital and incentives promote successful fisheries." Nature, 470: 386-389. doi :10.1038/Nature 09689

There has been a convergence of interest within the non-governmental organization (NGO), academic, and development communities around in effective community-based management. One of the promising proposed approaches for this type of management is the combination of TURFs with no-take reserve systems, or TURF-reserves, which have the potential to capture the ecological and economic benefits of appropriately located and scaled no-take zones, and channel them toward local communities by effectively limiting access to local stakeholders. Properly designed and sized no-take areas generally improve CPUE in fishing areas adjacent to reserves; [Figure 2-7] however, there is not sufficient data on the overall economics of TURF-reserve systems for local communities, given the potential downsides associated with lost fishing grounds and the costs of organizing, monitoring, and enforcement.

These TURF-reserve systems could well be the most important management approach for multi-species coastal fisheries, but we are far short of conclusive quantitative proof and major concerns remain. A recent study found that, among various co-management systems, local compliance with TURF systems was most problematic. Defining who has traditional access rights is often muddied by factors such as marriages, or changes in social groupings. The complications of proper design, enforcement, and operational capacity are challenges that will complicate broader adoption. But, interest in these approaches is growing, and efforts are underway from Mexico to Indonesia to marry the protected area and community-based fishery management approaches.

In considering their potential, it is important to recognize that these approaches have very real limitations:

- **Leadership and homogeneity.** Community-based management systems such as TURF-reserves do not work well in highly heterogeneous, densely populated areas; a Gutierrez and Hilborn[76] study of co-management documented the "critical importance of prominent community leaders and securing the livelihoods of communities depending on them." [Figures 2-6, 2-8]

- **Scale.** The applicability of TURF-reserves has been documented for sessile and semi-sessile species such as abalone, sea cucumber, lobster, and, potentially, reef fish with localized ranges. The effective application of TURF-reserves to mobile finfish is less clear. Initial estimates developed by Indonesian fishery scientists suggest that one would need a minimum management area of 500 square miles or more[77] in order to cover the ecologically determined range of these species. In densely populated areas, attempts to orchestrate CBFM over multiple communities can easily revert to an open access fishery, with all its attendant problems. While Japan provides an example of widespread CBFM for multiple species, an abiding challenge for philanthropy is how best to develop and scale new systems, given the huge number of coastal areas and individual communities that might each require their own tailored system.

- **Design.** In many cases, TURFs probably work especially well when integrated with properly scaled no-take areas protecting key habitats, such as spawning grounds. These reserves must be carefully designed, placed, and supported by the local fishing community. Without that strong foundation, no-take areas do not survive for long, particularly as the political support for protected areas in each community ebbs and flows over time. It is not clear at this point how a critical mass of properly designed TURF-reserve systems will be launched in the short- and medium-term, or how best to turn a local or regional movement into a global phenomenon.

[76] Gutierrez, N., R. Hilborn, and O. Defeo. 2011. Leadership, social capital and incentives promote successful fisheries. Nature 470: 386-389. doi:10.1038/nature09689

[77] Confidential Interview.

Figure 2-9

Effective fisheries management depends on the application of a wide variety of approaches

\+ Tool contributed
++ Important tool
+++ Essential tool

Region	Gear restrictions	Capacity reduced	Total allowable catch reduced	Total fishing effort reduced	Closed areas	Catch shares	Fisheries certification	Community co-management
• Bering Sea, Gulf of Alaska	+	++	+++		++	+++	+	+
• California Current	+	++	+++		+++			
• Northeast U.S. Shelf	+	++		+++	++			
• North Sea, Celtic-Biscay	+	+	+++	++	+	+		+
• Iceland	+	+	+++			+++		
• Southeast Australian Shelf	+	+	+++		++	+++	+	
• Northwest Australian Shelf	++				++			
• New Zealand	+	+	+++			+++	+	
• Kenya (Artisanal)	++				++			+++
• Chile and Mexico (Artisanal)	+++				+			+++
Count	**10**	**7**	**6**	**2**	**8**	**5**	**3**	**4**
Total score	**14**	**10**	**18**	**5**	**15**	**13**	**3**	**8**

Source: Boris Worm, et al., 2009. Rebuilding global fisheries. Science Vol. 325, 578

In summary, the basic tool kit required to manage fisheries is quite well known. The principles have been documented by international institutions such as the FAO. Fishery managers today are effectively using a variety of approaches, among which harvest control rules built around output controls, and enshrined in catch share approaches. These approaches are generally the most reliable in regions with strong centralized fishery management capacity. Community-based co-management, and particularly TURF-reserve systems, may have the most promise for small-scale coastal fisheries, particularly in the developing world. [Figure 2-9] Across all systems, basic input controls are an integral component of the system.

Although the basic tool kit is well known, practitioners are still learning what specific combinations of tools are best suited to particular fisheries. Understanding how to best match a specific management system to the characteristics of the fishery will need further attention to help guide future reform efforts, especially for small-scale fisheries. The evolution of fisheries management must proceed in a fashion that recognizes the limitations of management systems (e.g., capital constraints, institutional barriers, technological gaps), and develops the basic foundations before launching into more advanced goals.

Figure 2-10

Systemic vulnerability of fisheries is driven by three major factors – economics, biology, and institutions and policies

Systemic vulnerability of fishery = f (economic, biological, institutional/policy vulnerability)

1 Economic vulnerability

Economic characteristics that make a stock susceptible to over-fishing

- Stock effect – harvesting costs are not that sensitive to decrease in stock
- High discount rate
- Certain input and output price parameters
- Poverty and a lack of alternatives

2 Biological vulnerability

Species characteristics that make a stock susceptible to over-fishing

- Longevity/slow growth
- High age at first maturity
- Low fecundity
- Schooling
- Predictable aggregations
- Proximity to surface or shore
- Faithful to habitat

3 Institutional/policy vulnerability

Lack of capacity for government-led control over fish stock mortality

- Little to no management
- Complex, overly politicized, consensus-based management
- Illegal/amoral management
- Lack of opportunity for local control on mortality
- No legal basis for co-management solutions
- Absence of individual influence on mortality (by fishermen or cooperatives)

Figure 2-11

Vulnerable fisheries offer few rewards for individual responsibility

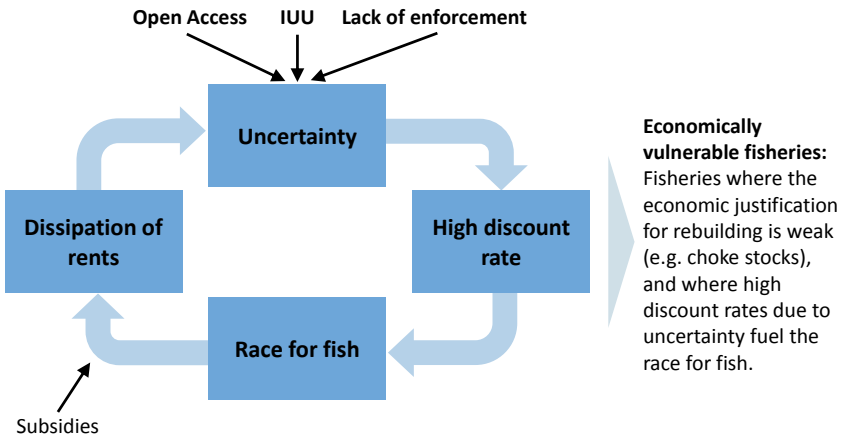


Figure 2-12

The greater the uncertainty, the greater the fisherman's implicit discount rate, and the more rapid deterioration of the fishery

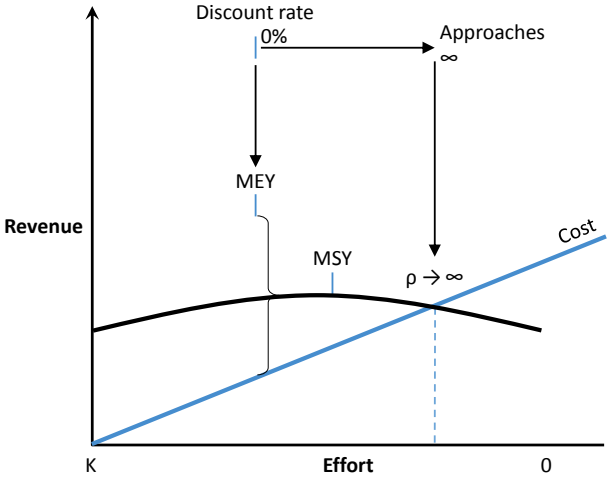
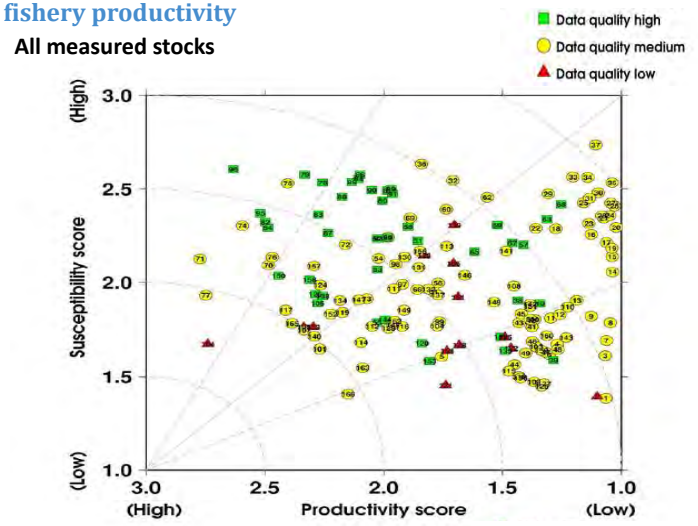


Figure 2-13a

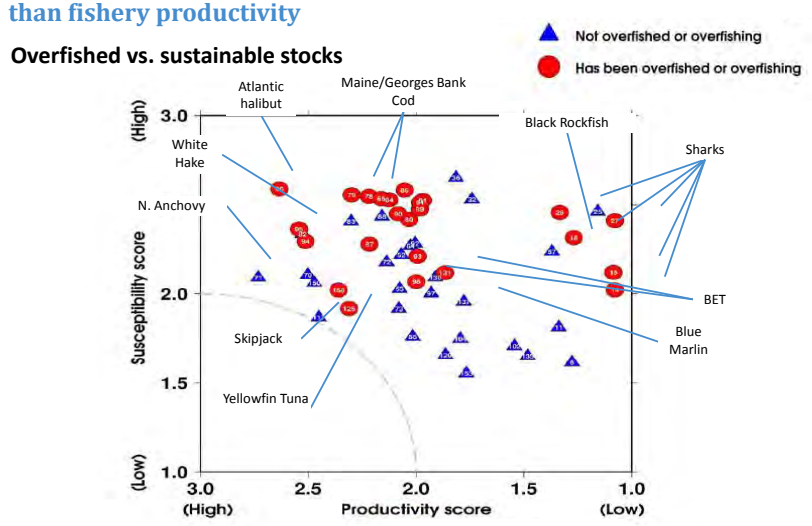
Susceptibility to fishing pressure is a better predictor of overfishing than fishery productivity



Source: W.S. Patrick et. al., 2009. Use of Productivity and Susceptibility Indices to determine Stock Vulnerability. NOAA.

Figure 2-13b

Susceptibility to fishing pressure is a better predictor of overfishing than fishery productivity



Source: W.S. Patrick et. al., 2009. Use of Productivity and Susceptibility Indices to determine Stock Vulnerability. NOAA.

CHAPTER 2: ROOT CAUSES AND SOLUTIONS

Argument 2:

The adoption of effective fishery management has been routinely blocked by a combination of institutional weakness and powerful economic forces

A combination of economic, biological, and institutional drivers determines any fishery's vulnerability to overfishing. [Figure 2-10] These factors strongly reinforce one another, and, collectively, they present a formidable set of obstacles to the implementation of best fishery management practices.

- Fisheries are economically vulnerable when they offer few rewards for individual responsibility. [Figure 2-11] In an open access system lacking effective effort and/or mortality controls, fishermen are rightly concerned about the security of future landings and have an economic incentive to value short-term yields over potential future landings. This uncertainty and competition often leads to unreasonable increases in capacity and effort ("the race for fish"), and inexorably erodes the economic fundamentals of the fishery. The greater the uncertainty, the greater the fisherman's implicit discount rate, and the more rapid the deterioration of the fishery. [Figure 2-12] If subsidies are introduced to improve the eroded economics, as they often are, they only serve to provide additional momentum in this spiral toward fishery collapse. Apart from highly productive and resilient fisheries (shrimp, anchoveta), most economically viable fisheries lacking effective mortality controls are bound to be overfished or collapse. Even highly productive fisheries will be overfished under these conditions. Fisheries that straddle multiple management jurisdictions have an additional source of management uncertainty, and it is no surprise that fish stocks deteriorate with the number of EEZs. [See Figure 1-7] In some fisheries, the cost of catching fish does not substantially increase as stocks decline. This lack of a "stock effect" is especially true for schooling fish such as cod, and for fish with easily targeted spawning aggregations, such as bluefin tuna or tropical grouper. With modern fish-finding technology, the last school of such a fishery is as easy to find as the first, providing absolutely no economic feedback to the fishers. When combined with the extra vulnerability imposed by high market prices (as with bluefin tuna), this effect is further compounded for valuable species.

- Biologically vulnerable fisheries (e.g., species that exhibit schooling behavior, slow growth rates, low fecundity, or high age at maturity, as well as fisheries close to coasts) are highly susceptible to fishing pressure and recover slowly. For example, shark populations globally appear to be far more vulnerable to overfishing than anchoveta populations, largely due to the low fecundity and growth rates of many shark species. Surprisingly, high susceptibility to fishing pressure is a better predictor of overfishing than low fishery productivity. [Figures 2-13a,b]

Figure 2-14

Fisheries that lack governmental or individual mortality control are highly vulnerable

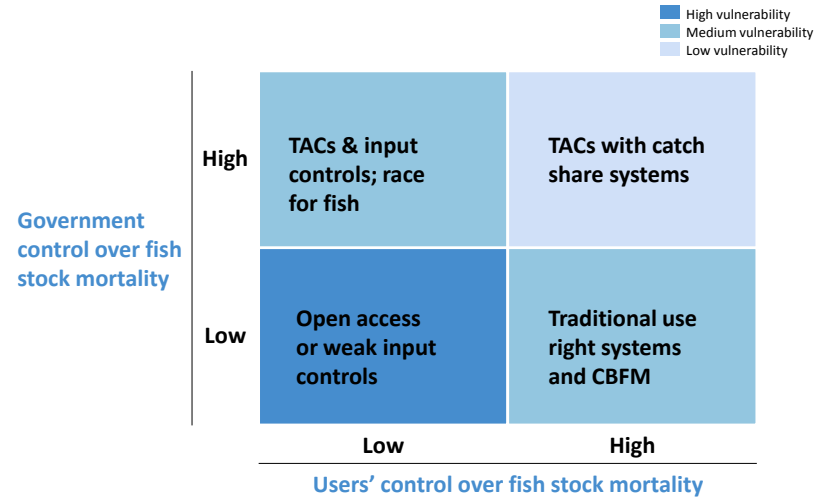


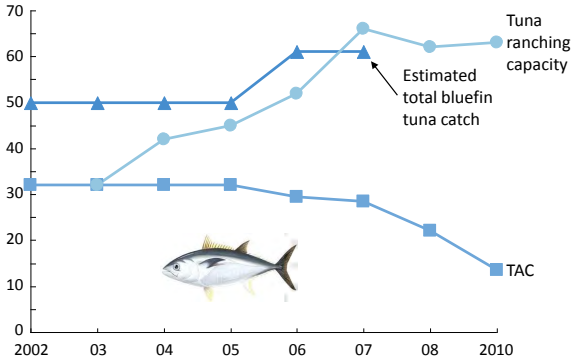
Figure 2-15

Although legal limits on EA BFT catch have fallen over the past 5 years, tuna ranching capacity continues to be ramped up

E. Atlantic bluefin tuna, estimated catch, total allowable catch (TAC) quota, recommended TAC, 2002-2010

Catch

Thousand metric tonnes



The International Commission for Conservation of the Atlantic Tuna (ICCAT) has set its TAC quota in excess of the scientifically recommended quota, and failed to regulate IUU fishing

Source: ICAAT SCRS, 2008, 2010; team analysis

- Institutionally vulnerable fisheries are plagued by the lack of control over fishing mortality rates. Simplistically, control over mortality can be exerted by government-led management regimes or by individuals or communities vested with some degree of control over fisheries (such as traditional use rights or CBFM). Fisheries with weak governmental and individual mortality controls are highly vulnerable to overfishing. [Figure 2-14] The absence of effective institutional control not only permits overfishing, but also effectively encourages overfishing because there is no guarantee that stocks will be there in the future. In other words, the effective discount rate is very high, which further fuels the race to fish.

The linkage is clear: a lack of institutional strength creates a level of uncertainty around future landings that only fuels the hard-wired race for fish. Very few economically relevant fisheries are biologically capable of enduring this level of effort without depletion or collapse. While the systemic drivers of overfishing are common across most fisheries, they play out over a unique set of actors and conditions in each fishery. These fishery-specific idiosyncrasies need to be understood and taken into account in order to overcome the barriers to reform and achieve effective fisheries management. To illustrate the need for greater fishery-specific information, the following three case studies explore the economics and dynamics of rebuilding fisheries: the Atlantic bluefin tuna fishery, the Gulf of Mexico snapper fishery, and the tropical grouper fishery.[78]

Eastern Atlantic bluefin tuna case study. The Atlantic bluefin tuna fishery is managed by ICCAT. The stocks are severely stressed, and the Commission members have proven incapable of taking decisive action. Under "business as usual" assumptions, we estimate the Eastern Atlantic bluefin tuna stocks will collapse in the next 4-7 years.[79] This scenario is based on the assumption that IUU fishing continues unabated in the coming years. There are some indications that efforts undertaken by ICCAT (e.g., implementing a vessel monitoring system, requirements to pay back quota overages) may already be slowing IUU fishing.[80,81] If these efforts continue to be successfully implemented, our business as usual scenario is overly pessimistic and the fishery may avoid collapse, or even achieve ICCAT targets for recovery to B_{MSY} by 2022.

The eastern Atlantic bluefin tuna industry is dominated by purse seiners, who take 60% of the legal catch (the remainder is caught by long-liners, traps, bait boats, and trawlers). Substantial overcapacity exists in the purse seine fleets, with over 250 boats added in the last ten years to a fleet now totaling over 600 vessels. The boats mostly catch young tuna during spawning aggregations, which eliminates most of the stock effect.[82] The full nets are then dragged to grow-out farms, where the tuna are fattened for eventual export to Japan. The farms have been built, at great capital expense, to accommodate five times the volume of current TACs. [Figure 2-15]

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[78] These case studies combine the biological modeling (by UCSB/Eco-analytics) and economic modeling of restoration scenarios (led by McKinsey and Company).

[79] Collapse here is defined as less than 10% of the sustainable biomass, or the biomass which delivers the maximum sustainable yield. For the East Atlantic Bluefin tuna, this was determined to be approximately 350,000 tons.

[80] Taylor NG, et al., 2011. Atlantic Bluefin Tuna: A Novel Multistock Spatial Model for Assessing Population Biomass. PLoS ONE 6(12): e27693. doi:10.1371/journal.pone.0027693

[81] ICCAT, 2010. Atlantic Bluefin Tuna Stock Assessment: Summary.

[82] i.e., the cost of fishing does not increase as the stock levels decrease; there is no economic feedback loop or warning signals

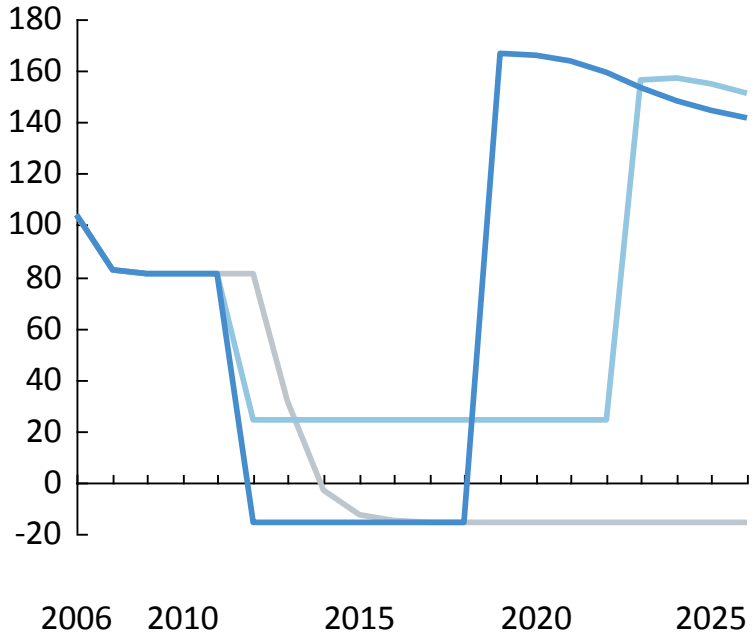
Figure 2-16

Summary of scenarios

BAU
ICCAT/NO IUU
Closed until recovery

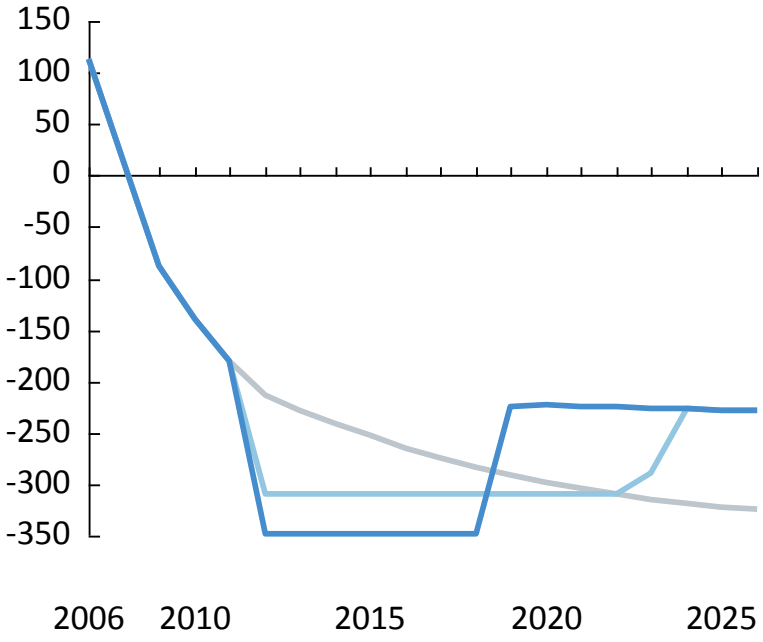
Purse seiners: Total yearly net income

Yearly cash flow
$ Millions (each scenario)



Ranchers: Total yearly net income

Yearly cash flow
$ Millions (each scenario)



We combined age-structured biological models and detailed cost models to shape three potential scenarios for the future of this bluefin tuna fishery:

- "Business as usual": This scenario assumes current TACs and levels of IUU fishing remain constant
- "No IUU": This scenario assumes that ICCAT successfully implements the recently specified reductions in IUU rates and TACs.
- "Close until recovery": This scenario assumes a total closure of the Atlantic bluefin fishery until the stock is fully recovered (B_{MSY}), with TACs then set at F_{MSY}. It also assumes complete cessation of all IUU fishing.

Business as usual. At current levels of fishing mortality, the Eastern Atlantic bluefin tuna fishery will collapse in the next 4-7 years. A recovery plan was put in place in 2006, and recently strengthened due to pressure from the environmental community. On the advice of scientists, ICCAT recently reduced the fishery's TACs by 4%, and this TAC reduction has some chance of avoiding stock collapse,[83] but only if no IUU fishing occurs. There are some indications that efforts to reduce IUU are beginning to have an effect, but it remains to be seen to what degree they will reduce IUU. As recently as 2009, IUU landings exceeded ICCAT's TACs by nearly 2.5 times, and a quick tabulation of recent Japanese imports suggests that this trend is continuing. If current harvest levels (approximately 40,000 tonnes per year) are maintained, the stock will reach the point of collapse by 2014. Other assessments of the trajectory of the Atlantic bluefin stock have been more optimistic.[84] This is due to differences in the modeling methodology: the two key differences appear to be the assumptions around IUU and the current biomass level of the Eastern Atlantic bluefin tuna.[85]

The reason this overfishing is so resilient is that ICCAT is faced with the perfect storm: institutional inability to enforce IUU or set aggressive TACs; economic disruption brought on by overcapitalization of fisheries and ranchers, as well as tuna price volatility; and high biological accessibility to high fishing pressure. All this leads to massive uncertainty and a race for fish in a de facto open access fishery which, in the absence of meaningful enforcement, does not stop at the specified TAC. The ease with which tuna are caught in spawning aggregation sites means that purse seiners see a very low stock effect in their catches, which further sets the species on the path to collapse.

Fishery restoration. Returning the bluefin tuna stock to BMSY could be achieved by closing the fishery altogether until recovery occurs, or by completely eliminating IUU in order to allow ICCAT's new TACs time to rebuild the fishery - ICCAT has set a target of rebuilding the fishery by 2022. A complete closure would produce a full recovery within 6-11 years, while the latter proposal carries some risk of fishery collapse, even if perfectly implemented. Either scenario would be beneficial for most of the major economic actors in the industry over the long run, except for those purse seiners benefitting today from IUU, and for the tuna ranchers who also currently rely on IUU. The elimination of IUU would yield purse seiners incremental rents of $20 million over five years, and nearly $400 million over 15 years (in net present value). Closing the fishery until recovery would eliminate purse seiner rents of $144 million in the first five years, but that would be compensated by an incremental rent of $466 million over a 15-year period. [Figure 2-16] Tuna ranchers, who are already losing money, are the biggest losers in any recovery scenario, and they can be expected to oppose further TAC reductions and IUU elimination efforts vigorously.

[83] Three out of 11 of our modeling scenarios resulted in fishery collapse.

[84] Taylor, Nathan, et al. 2011. Atlantic Bluefin Tuna: A Novel Multistock Spatial Model for Assessing Population Biomass. PLoS ONE 6(12): e27693. doi:10.1371/journal.pone.0027693

[85] The Taylor study assumes that Eastern Atlantic bluefin is at B_0 in 1950 and uses landings history in an age structured model to estimate current and projected B/BMSY levels. Using this methodology they estimate SSB in 2008 to be about .85 BMSY. The most recent stock assessment from ICCATT estimated SSB to be between .19 and .51. A second key difference is that the Taylor study assumed that future catches would be constrained to the TAC (i.e., no IUU will occur).

Greater reform is unlikely without more active pressure from affected sections of the markets. ICCAT has a difficult challenge in allocating quota to individual vessels, enforcing this quota, and excluding "flag of convenience" vessels, making IUU a resilient problem in the fishery. One potential pathway forward would be for the mainly Japanese buyers of bluefin to restrict their purchases to those fish that were verifiably caught by compliant vessels, or to support a six-year shutdown of the fishery, but the feasibility of this buyer-collusion solution is not clear. Ideally, the market should advocate for the establishment of a rights-based management system for bluefin, such as a catch share system, in order to better align the incentive of the fleet with a longer time horizon. This system could potentially eliminate the race to fish and prove to be a powerful deterrent to IUU fishing.

Gulf of Mexico Red Snapper case study

The U.S. Gulf of Mexico red snapper fishery is an ideal demonstration of the efficacy of various management schemes for different players accessing a single fishery. Red snapper, which has been heavily exploited, is currently covered under the Magnuson-Stevens Act and is under a rebuilding plan with a TAC set to return snapper to target levels. Fifty-one percent of the TAC is allocated to commercial fishermen, with the remainder of the TAC shared across the recreational segments of the fishery: private anglers, smaller charter boats which take out 4-6 people per trip, and larger "headboats" which can accommodate groups of around 20 to 80 recreational anglers per trip.

The commercial sector operates under an effective, relatively data-rich IFQ system which allows commercial fishers to keep track of their collective impact on the fishery. It has actually come in under its TAC (~3% below) every year since implementation, furthering red snapper's path to recovery. Despite these efforts, the recreational segment routinely exceeds its allocated TAC and does not have appropriate tools to fish sustainably as a collective. Our model thus predicts that the fishery as a whole is still expected to fail to reach its rebuilding targets (a spawning potential ratio (SPR) of 26% by 2032).The recreational sector overshot its target 13 out of the 18 years from 1991 to 2008 by as much as a 100%, compounded by very high discard rates/mortality.[86,87]

The recreational sector has a strong desire to preserve the snapper resource, but lacks the tools and management scheme to do so. To meet rebuilding targets, management is currently forced to progressively shorten the recreational fishing season. Uncertainty around future season length, which reached an all time low of 48 days in 2011, fuels a derby fishing mentality that only exacerbates the management challenge. Discard mortality remains high due to a combination of low bag limits, high minimum size requirements, and inadequate information regarding the proper handling of fish. Additionally, minimum size requirements may not be an appropriate management tool for species of fish such as red snapper that are not particularly resilient to catch and release. Certain fishers who may adhere to the two fish per person limit regardless of size of fish caught may be forced to throw back and kill undersized fish.

In order to reduce "derby fishing," an ITQ could be established in the for-hire sector, which includes headboats and charter boats. This would help keep the for-hire segment of the recreational fishing industry within the appropriate limits, while improving the overall economics of the for-hire sector substantially. Given their impact in the fishery, private anglers will need improved management as well if we expect to achieve sustainable fishing in the Gulf. There have been some innovative ways to better engage private anglers in contributing real time data, and there should be increased efforts to enhance the fishing experience for private anglers while preserving the fishery.

Box 4: Notes about Snapper case study

For the purposes of this exercise we have treated the Gulf of Mexico red snapper fishery as an isolated, single species fishery, while taking into account bycatch taken by shrimpers operating in the Gulf of Mexico. We assume that shrimpers initially take 2,700 metric tonnes of snapper, with their take increasing as the stock's biomass increases. Our model does not take into consideration changes in biomass as a result of fishing for other species typically found in the Gulf of Mexico. Such species include grouper, lobster, crab, and red drum. Biomass of the red snapper stock is also affected by changes in temperature, and the dead discard rate also heavily depends on depth at which recreational fishers are fishing. This model does not capture all of the nuances of the actual fishery. However, it is meant to provide high-level insights into the biological and economic dynamics of the different players in the fishery with respect to each other and with respect to red snapper.

[86] For every five fish landed, six fish are killed through the discarding process, according to recent estimates by NOAA scientists and the Southeast Data Assessment and review report.

[87] It is important to note that the dead discard rate also includes mortality as a result of regulatory discards (i.e., discarding fish that is below minimum size limits), and it is possible that stricter regulations will increase the discard rate. This relationship should be further explored in order to determine the ideal amount and combination of regulations in the recreational sector.

We modeled five scenarios to suggest how best to reach the SPR targets for this fishery:

- "Business as usual", with current rates of recreational sector dead discards and quota overruns
- "IFQ in the for-hire sector", with accountability and adherence to a quota by charter boats and headboats (we assume 30% of recreational TAC goes to charter boats, 20% to headboats, and 50% to private anglers), and business as usual activity by recreational fishers
- "Dead discard reduction", where dead discards in the recreational fisheries are reduced from 1.2x to 0.5x the weight of harvests
- "Strict quota conformance" by all players – commercial and recreational – but maintaining current discard and discard mortality rates
- "Strict quota conformance and reduced dead discards" by all players, which is the ideal scenario

The following major insights are gained from an exploration of the results [for Figure 2-17, please see next page]:

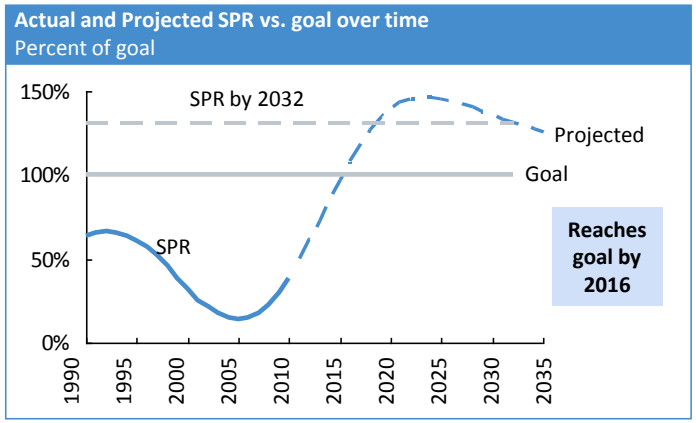
- A 60% reduction in dead discards from 1.2x harvested weight to 0.5x harvested weight has astonishing results. By 2018, the total harvest increases 2.5x for all sectors. Private angler days-at-sea restrictions become unnecessary almost immediately, while the season for head boats and charter boats increase by 3-4 times its current length. Over the next five years, commercial profits would increase by $9 million, headboats by $90 million, and charter boats by $122 million (putting that whole industry back into profitability). The findings highlight the huge effect that private angler discard mortality has on economic rents across the entire industry.
- A strict quota-compliant ITQ system for charter boats and headboats fails to reach the 26% target spawning potential rate by 2032. This shows that a solution that does not require private anglers to fish to quotas and reduce dead discards is not an adequate solution. Commercial fisher profits remain relatively constant, and they do not see an increase in the amount of fish that they can catch. Headboat profits would increase by $105 million over the next five years, while charter boat profits would increase by $47 million over the same time period.
- The ideal solution to maximize economic rents in the fishery would include establishing an ITQ system for the charter boat and headboat sectors, supplemented by aggressive steps to limit discard mortality. Such actions could include punitive fines for highgrading, the creation of an angler certification and education program, and establishing a system of accountability for recreational fishers such as tagging.

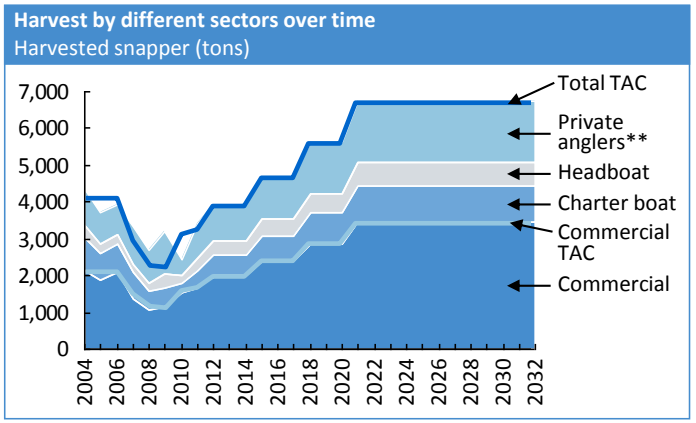
Tropical Grouper case study

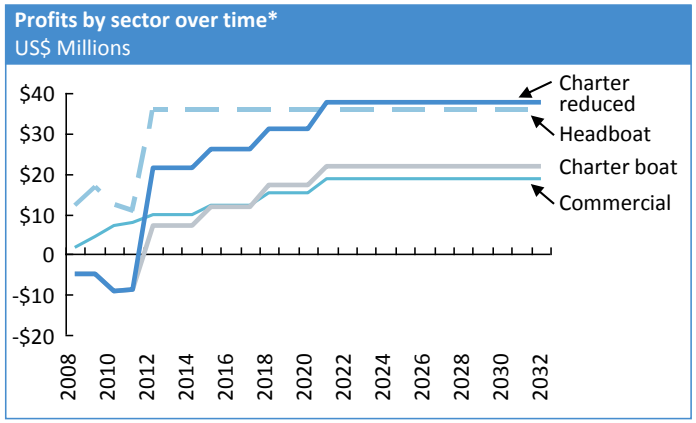
Grouper is an important fish in Southeast Asia, primarily because of the astronomically high prices certain grouper species can fetch in the Hong Kong and mainland China live reef food fish trade (LRFFT). However, grouper has been widely overfished throughout much of the region, and (in the absence of formal stock estimates) professionals indicate that the biomass of these species is well below B_{MSY}. The overfishing of groupers has continued unabated and has expanded into new regions. In some parts of the Coral Triangle, the ecological damage is exacerbated by the presence of destructive fishing gear such as cyanide. If current overfishing continues unabated, our illustrative model points to the regional collapse, depriving many local fishermen of a lucrative livelihood, and significantly damaging an unparalleled marine ecosystem.

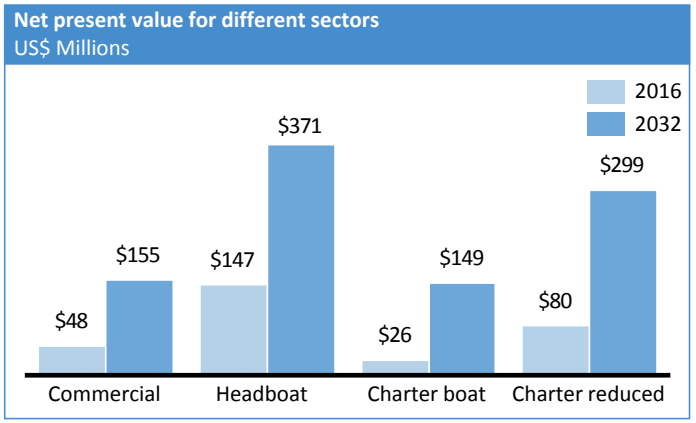
Figure 2-17

Preferred snapper scenario: TAC compliance and reduced dead discards









* Profits of the for-hire sector depend on number of days that they are on the water
** Season length for private anglers steadily increases to a full-year season

Reversing the region-wide overfishing trend is difficult given that there are multiple factors that drive overfishing. The strong and growing demand for live reef fish (primarily sold in restaurants in China and Hong Kong) provides a powerful incentive to catch these fish, even when substantial costs are involved in hunting down remaining populations. To link markets with the disparate fisheries in Indonesia, the Philippines, Malaysia, and throughout the region, influential live reef fish traders act as middlemen, further enabling overfishing. Traders are often mobile, establishing outposts throughout the region to collect fish (and leaving when serial overfishing occurs), providing gear in some cases, and establishing markets for undersized fish which can be "grown out" in marine cages. The need to harvest live fish has encouraged the use of highly destructive cyanide fishing in some regions. Most importantly, a vacuum of effective fishery management capacity voids the prospect of limiting mortality to the scientifically appropriate levels. The challenge is made all the more difficult given that grouper complexes are often not well understood, and are slow growing species.

In the absence of specific fishery data, we constructed a hypothetical model that builds on known biological and market characteristics. The outlook is not encouraging. Even if fishing is constricted to coastal communities, we find that the stock collapses—i.e., declines to 10% of carrying capacity—by 2030.[88] If we add in large-scale commercial operations of the type we now see in the field, populations collapse within four years. Any maximum sustainable yield scenario eliminates large-scale commercial operators entirely, and restricts artisanal harvests. Given the profits involved in the LRFFT, this is hard to imagine.

A handful of potential solutions have been suggested:

- There is general consensus that marine reserves are a necessary tool, and at a minimum need to better protect grouper spawning aggregation areas.
- National cyanide bans would help to increase the average harvested fish size, thereby contributing to both the biological and economic situation, but would not be sufficient to solve the problems of overfishing.
- Size limits on live reef fish and national cyanide bans would help to increase the average harvested fish size, thereby contributing to both the biological and economic situation, but would not be sufficient to solve the problems of overfishing.
- Trade-based solutions and other market interventions (export quotas, market campaigns, the Convention on International Trade in Endangered Species (CITES) listings, FIPs, etc), could potentially limit growth in demand, but would be very challenging to successfully implement and would not address overfishing occurring for subsistence and local markets. These efforts are unlikely to be effective in the presence of substantial IUU and illegal trade.
- Ultimately, any viable solution requires limiting overall fishing mortality. Protecting spawning aggregations and undersized fish, reducing the use of destructive gear, and dampening market demand for the end product, while valuable efforts, will not be sufficient to solve the problem. Given the complexity of government-led management for multi-species, near-shore fisheries in the region, considerable attention has been placed on promoting effective community-based management solutions, such as TURFs and reserves. The development of TURF-reserve systems should be promoted and potentially linked to a market-tenure system for major traders, and supplemented by export quotas and better regional import-export controls.

[88] For all scenarios we assume the starting biomass of the fishery is 38.75% of carrying capacity. Regionally, grouper stocks are likely below B_{MSY} (around 50% of carrying capacity). However, individual stocks may range from untouched to fully depleted. The hypothetical stock we model sits somewhere in the middle, or perhaps slightly closer to untouched.

Figure 2-18

Though sustainable fisheries may be more profitable, attempts to manage them have not always yielded expected results

Lack of sustainable fishery management has resulted in what looks to be significant value loss

Source	Estimated yearly value lost $ Billions
• FAO 1993	54
• Garcia & Newton 1997	46
• Sanchirico & Wilen 2002	90
• Wilen 2005	80
• World Bank 2008	51

If players are making rational economic decisions, there must be a reason this value isn't being captured

Three hypotheses

1. **Winners and losers**
   - Value doesn't accrue equally to all players, some will win and others will lose
   - Losers tend to block attempts at reform
2. **Losses during transition**
   - Losses will be incurred when less fish are caught during transition – these might be too large for the industry to bear
   - Depending on discount rates recovery could be NPV negative
   - Past studies use social discount rates, which are much lower than industry rates
3. **Management cost not accounted**
   - Management costs could exceed additional value captured
   - In many places, there are no means to finance management

Source: World Bank "Sunken Billions"

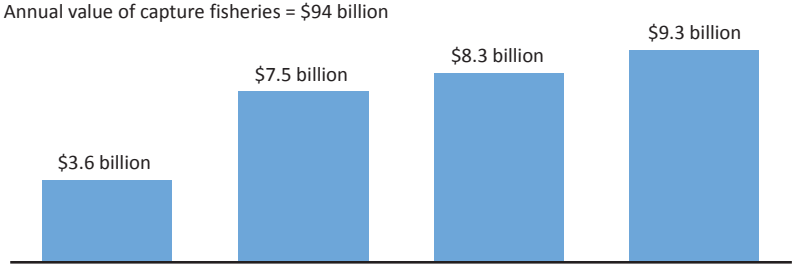
Figure 2-19

Estimates of annual global fishery management costs range from 4-10% of the value of the capture fisheries

Management costs

U.S.$ Billions

Annual value of capture fisheries = $94 billion



WWF (2001)
- Country subsidies were compiled from international organizations
- Subsidies towards management are shown here

OECD (2003)*
- Cost of management were submitted by OECD countries
- Global costs were extrapolated based on average cost per metric ton

Khan et al. (2006)
- Country subsidies were compiled from numerous sources
- Subsidies towards management are shown here

Sumaila et al. (2010)
- Revised analysis by Khan et al. (2006)

* Global costs were extrapolated based on values reported by OECD countries

CHAPTER 2: ROOT CAUSES AND SOLUTIONS

Argument 3:

The transition to sustainable fishing is hard

The ocean is a productive system. Global overfishing is reducing the productivity of the system, in both biological and economic terms. Estimates of the economic rents lost to overfishing range from $50 to $90 billion per year.[89] [Figure 2-18] Since Garrett Hardin defined the tragedy of the commons, we've recognized that the rational economic decisions of individuals in a commons are a recipe for disaster. Efforts to overcome that basic stumbling block are often thwarted by a suite of compounding economic and institutional barriers such as those described here.

Economic barriers to fishery restoration

- Asymmetric allocation of losses and benefits. Fishery restoration can be costly for those that depend on the fishery. Typically, losses are not spread equally across the fishing industry value chain. The distinct economics of major actors (capital intensity, operating margins, discount rates, etc.) make it possible for some to weather restoration in great shape; others, however, face truly existential threats. For example, a shutdown of the bluefin tuna industry to restoration would impose a total burden of $100 million per year on purse seiners and tuna ranchers. The Spanish bluefin tuna grow-out farms would lose $75 million per year. The inevitable resistance of risk-averse actors jeopardized by the transition is often difficult to overcome in the politically charged decision-making processes.

- High management costs. Fishery management itself can be expensive and is typically not financed through cost recovery programs from landings. Globally, management costs in the Organization for Economic Co-operation and Development (OECD) countries range from 4-10% of the value of the capture fisheries. [Figure 2-19] Where fishery management institutions are currently weak, finding new resources for fisheries is a huge obstacle. Public regulatory entities are typically cash-starved, and an already strained industry is understandably unwilling to contribute to the collection box. The costs of developing or reforming management are typically not included in the calculations of the costs and benefits of restoration. In the case of tropical grouper, the need to build a functioning management system in several countries, whether at the national, municipal, or community level, is the fundamental limiting factor in fishery recovery.

- Data gaps. Huge data gaps frequently lead to market failure. For example, the true count of Atlantic bluefin tuna caught by purse seiners and transferred to grow-out farms is not known, nor is the precise amount of IUU fishing currently decimating the stocks. Without a semblance of accurate catch data, it is impossible to manage one of the world's most important fisheries. More generally, of the tens of thousands of fisheries in the world, we have detailed stock assessments for fewer than 1,000. When stock assessments are missing, as they are for minor stocks or most fisheries in the developing world, management decisions must be based on fishery dependent data, such as coarse effort and landings estimates.

- High industry discount rates. High discount rates often make fishery restoration economically unattractive. In the most extreme case, a hungry subsistence fisherman has an almost infinite preference for today's catch over next year's. In general, fleets in the developing world, working with no guarantees that stocks will be there in the next year, operate under real or implied discount rates that exceed, year by year, the rate of increase in rents created by potential fishery restoration.

[89] e.g., FAO, 1993; Garcia & Newton, 1997; Sanchirico & Wilen, 2002; Wilen, 2005; World Bank, 2008

Figure 2-20

A minority-protective decision making process in RFMOs prevents ambitious measures from being passed

RFMO	Decision making process	Barriers to implementation
ICCAT	• In practice, consensus – in the past 40 years, ICCAT has only had six parties object to three recommendations (according to its Convention, ICCAT only needs majority support	• ICCAT effectively limits participation of meetings with high fees. The limited transparency leads to decisions being not well understood or well considered. This can decrease accountability
IOTC	• By 2/3 majority	• Any party may opt out with no justification or consequences
IATTC	• Consensus	• End up with the "lowest common denominator" or inaction • Chile and a number of other coastal states are not members. Limited VMS for large fishing vessels
WCPFC	• Consensus	• End up with the "lowest common denominator" or inaction
CCSBT	• Consensus	• Self-assessment of CCSBT states that "management measures associated with capacity reduction are best left to members' domestic arrangements"
GFCM	• Majority; consensus for financial decisions (allocation of member contributions, etc.)	
CCAMLR	• Consensus	• End up with the "lowest common denominator" or inaction • There is an opt-out provision

Source: http://www.dfo-mpo.gc.ca/fgc-cgp/documents/mcdorman_e.htm

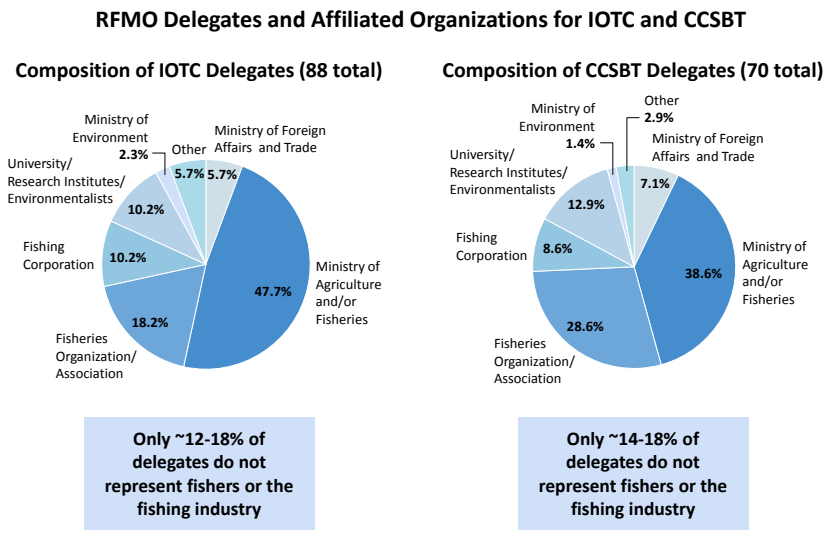
Institutional and structural barriers to fishery restoration

The institutional and structural barriers to fishery restoration include lacking institutional capacity, weak or non-existent data, and weak, consensus-oriented decision-making systems. These barriers are especially pronounced among the high seas fisheries administered by UN-mandated RFMOs, and among fishery management institutions in the developing world. We will discuss these in turn.

Regional Fishery Management Organizations (RFMOs). With few exceptions, RFMOs operate with a consensus-based decision-making process. In some cases, the need for consensus is a formal operating rule of the RFMO. In other cases, it has emerged informally as the standard practice. [Figure 2-20] The failure to reach decisions would result in open access in the fishery; consequently, the consensus-based rules protect the inevitable economic losers, who routinely block fisheries restoration. Similarly, the system is an inherently difficult forum in which to promote any measures—such as stock management, bycatch limits, and habitat protections—that violate any of the parties' narrowly defined economic self-interest. For example, in 2010, NGOs recommended a TAC reduction of 50% for bluefin tuna, but the delegates of ICCAT could agree to only a 4% reduction for the following year, which was associated with just a 60% probability of reaching biomass target levels.

Figure 2-21

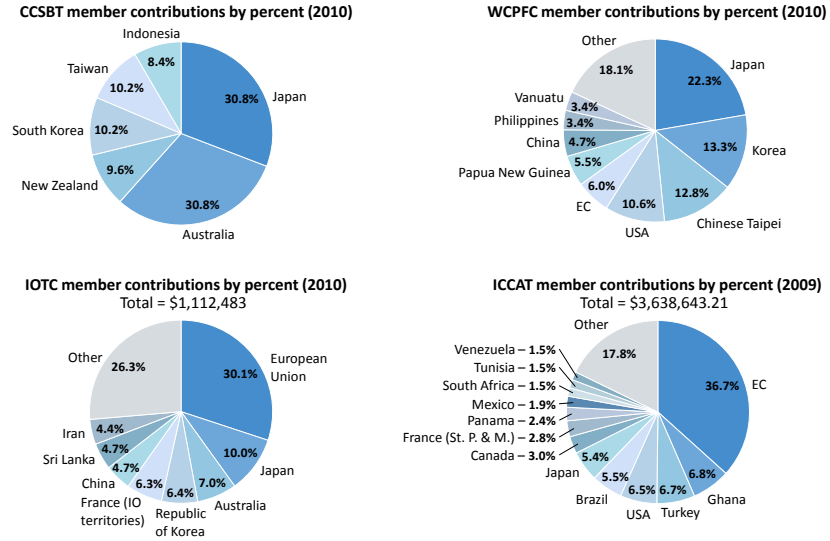
Nearly all RFMO delegates represent fishing interests



Source: http://www.iotc.org/English/index.php; http://www.ccsbt.org/site/

Figure 2-22

RFMOs are financially dependent on member contributions



Source: http://www.iotc.org/English/index.php; http://www.ccsbt.org/site/; http://www.wcpfc.int/; and http://www.iccat.int/en/

Conservation interests are not well represented in RFMO decision-making. Nearly all RFMO delegates represent fishing interests. [Figure 2-21] In the Indian Ocean Tuna Commission (IOTC), for example, 50% of delegates represent an agricultural or fishery ministry, 20% fisheries organizations, and 10% fishing corporations. To make things worse, RFMOs are financially dependent on member contributions, and large fishing nations often have disproportionate funding shares (Japan and Australia contribute over 31% of Commission for the Conservation of Southern Bluefin Tuna's (CCSBT) budget).[90] [Figure 2-22] Implementing and enforcing conservation decisions is often blocked by a lack of funding from members opposed to self-funding enforcement and planning. This tendency is exacerbated by a lack of transparency of RFMO proceedings.

The RFMO mandate and legal platform is weak. The UN Convention on the Law of the Sea (UNCLOS) provides only vague standards, which do not explicitly prohibit over-exploitation.[91] The UN Fish Stocks Agreement (UNFSA) provides a fishery management framework, but not all RFMO members are UNFSA Contracting Parties, and can thus block reform by opposing UNFSA. In violation of UNFSA standards, for example, RFMO members often wait for extensive (and elusive) scientific evidence of stock decline before implementing conservation measures.[92]

RFMOs are only as effective as their members allow them to be. As a result of perverse incentives, and a minority protective decision-making process, RFMOs have become paralyzed by their own contracting parties. [See Appendix 3 – RFMO Review]

Developing world fishery management agencies. Effective mortality controls for small-scale coastal fisheries are notoriously difficult to impose. In data-poor, highly decentralized environments, TACs and quotas are very difficult to implement. CBFM involving limited access systems such as TURF-reserves are more suitable, but require significant (and often elusive) scale to work for mobile species like finfish, and can be entirely pre-empted by open access laws.

In many parts of the developing world, the management of industrial-scale fisheries is also beyond the institutional capacity of these countries. In highly decentralized archipelagos such as Indonesia and the Philippines, even straight-forward, effort-based input controls are notoriously tough to implement. The data gaps are huge, stock status is almost entirely unknown, and landings and effort data are not systematically collected. Districts and provinces often have enforcement rights, but those are used unevenly, if at all.

To make matters worse, uncontrollable third parties are often in play. Frequently, well-financed IUU fishing in foreign water is protected by diplomatic pressure. International distant water fleets operate under a variety of arrangements, some of them legal under foreign access agreements and overseas development aid agreements, others protected by inside deals and flags of convenience. Improving the status of these fisheries cannot rely on CBFM. Instead, it will require a longer-term change of government capacity and improvements in the rule of law.

Within the developing world, many of the core ingredients for effective fisheries management are much broader than the scope of this study. Fisheries management challenges may not be adequately addressed without progress on overarching problems such as, economic development, corruption, alternative livelihoods, and infrastructure development, to name a few.

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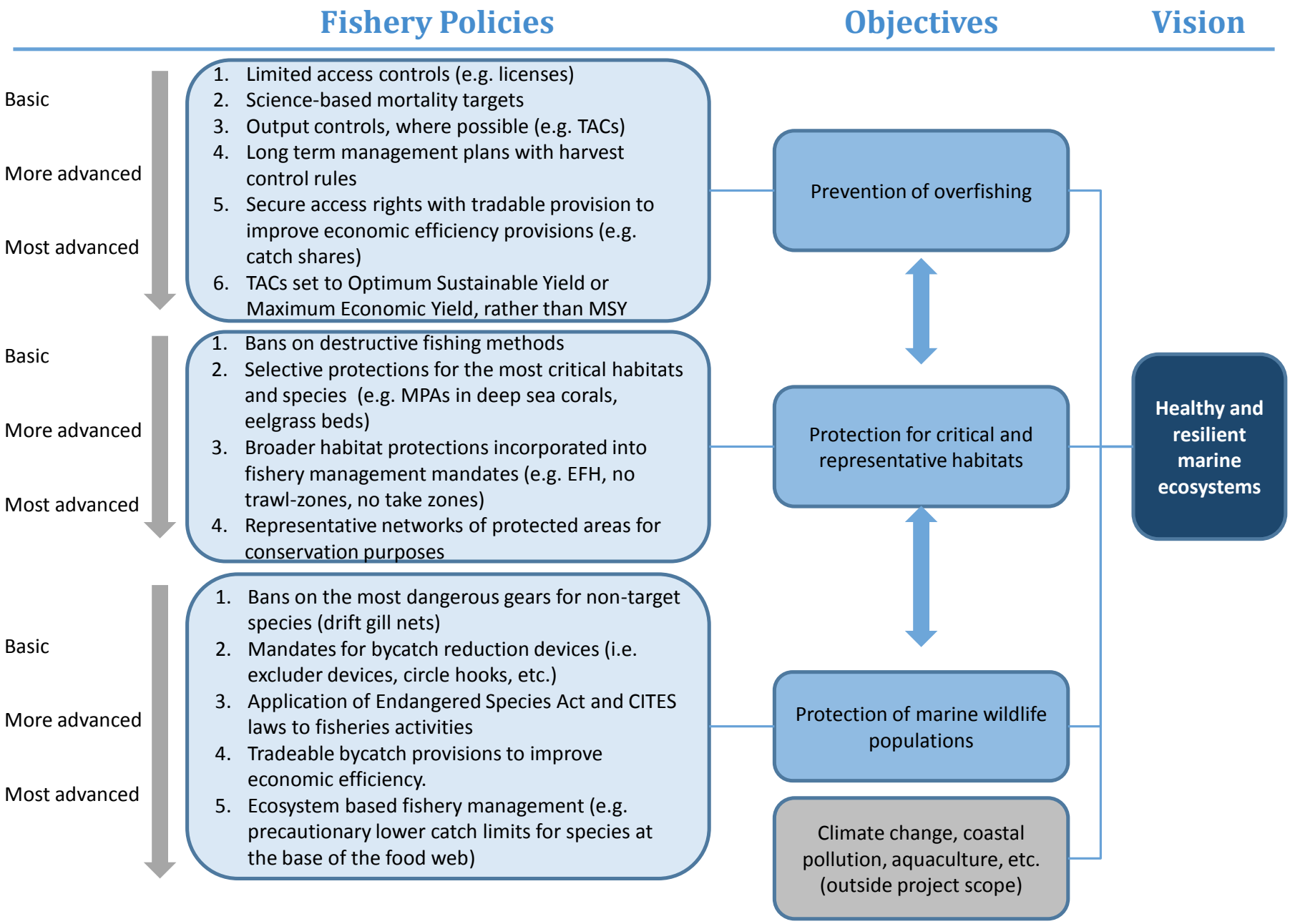
[90] The United States and European Union contribute roughly 30% and 40% of IATTC's annual budget respectively.

[91] Article 61(2) of UNCLOS states that "coastal state[s]…shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation." This clause does not explicitly prohibit over-exploitation, and does not clarify whether resources should be defined by specific stocks, species or biomass.

[92] In March, 2010, the Foreign Minister of France stated that, "France wants to wait for a scientific report on Bluefin tuna due next year before the world community bans trade in the fish". In June 2008, measures to protect juvenile bigeye tuna and yellowfin tuna were rejected by IATTC because of the inherent uncertainty in scientific stock assessments.

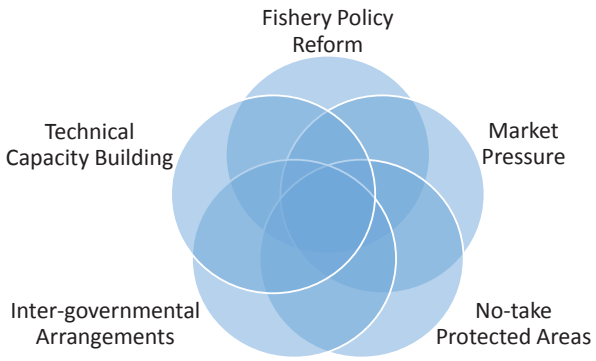
Figure 3-1


Fishery Policies
Objectives
Vision
Basic
More advanced
Most advanced
1. Limited access controls (e.g. licenses)
2. Science-based mortality targets
3. Output controls, where possible (e.g. TACs)
4. Long term management plans with harvest control rules
5. Secure access rights with tradable provision to improve economic efficiency provisions (e.g. catch shares)
6. TACs set to Optimum Sustainable Yield or Maximum Economic Yield, rather than MSY
Basic
More advanced
Most advanced
1. Bans on destructive fishing methods
2. Selective protections for the most critical habitats and species (e.g. MPAs in deep sea corals, eelgrass beds)
3. Broader habitat protections incorporated into fishery management mandates (e.g. EFH, no trawl-zones, no take zones)
4. Representative networks of protected areas for conservation purposes
Basic
More advanced
Most advanced
1. Bans on the most dangerous gears for non-target species (drift gill nets)
2. Mandates for bycatch reduction devices (i.e. excluder devices, circle hooks, etc.)
3. Application of Endangered Species Act and CITES laws to fisheries activities
4. Tradeable bycatch provisions to improve economic efficiency.
5. Ecosystem based fishery management (e.g. precautionary lower catch limits for species at the base of the food web)
Prevention of overfishing
Protection for critical and representative habitats
Protection of marine wildlife populations
Climate change, coastal pollution, aquaculture, etc. (outside project scope)
Healthy and resilient marine ecosystems

CHAPTER 3: A GLOBAL AGENDA FOR SUSTAINABLE FISHERIES

SUMMARY

Figure 3-2
Five cross-cutting approaches



Overall theory of change

One of the challenges in opening a dialogue about any global strategy is that there are many legitimate ways to dissect and discuss a problem. In the case of fisheries, some advocates focus on a particular piece of the problem (e.g., overfishing or protecting bycatch species), some on a tool or approach to address the problem (e.g., engaging seafood markets or promoting catch shares) [Figure 3-2], and others on a specific fishery or geography. This division of labor tends to silo advocates and philanthropists into their narrow areas of focus, such that it can be difficult to communicate and coordinate with others in the same community about conservation strategy.

The conservation community is unified in its end vision of a healthy and resilient marine ecosystem. Similarly, there is widespread acceptance of the notion that achieving this vision requires that fisheries have sufficient safeguards in place to prevent overfishing and to prohibit undue impacts on the marine environment (habitat, wildlife, and non-target species). But, the appropriate policies best able to achieve those objectives can vary widely by region, due to factors including institutional capacity and the biology of the targeted stock. As discussed in Chapter 2, there is a wide spectrum of fishery management policies and regulations intended to help reach these objectives. [Figure 3-1]

Where communication tends to break down is in the discussion about the best mechanisms and strategies to drive policy reform. Approaches range from efforts to directly reform fishery policy and establish protected areas, crosscutting initiatives to establish catch share systems or transform the market for seafood, and longer term initiatives to build capacity and promote community based fishery management. Each of these avenues of work is important in its own right, and typically complements the others.

For example, developing a market for sustainable seafood is not a substitute for policy reform, but a market transformation initiative can encourage fisheries to adopt better practices, particularly in areas normally outside of the conservation community's reach. Similarly, work to promote catch shares and strengthen access rights in fisheries is being pursued with the recognition that those policies help lock in better fishery regulations (limited access provisions, more conservative TACs, etc.). As captured in Figure 3-3, we see a distinction between the general tools and tactics being applied (e.g., policy advocacy, intergovernmental engagement, seafood market partnerships, etc.), the systems objectives being sought (seafood market transformation, stronger economic incentives, fishery governance reform), and the biological objectives we ultimately hope to achieve. We believe that that each of the main systems objectives is mutually reinforcing. Moreover, this whole dynamic functions most efficiently when a series of enabling conditions (e.g., traceability, sound science, the presence of a certification system) are established.

In this chapter, we will outline five highlighted focus areas:

1. Lock in existing gains in responsible fishery management in the developed world, and gradually transition toward an EBFM focus on habitat and marine wildlife.
2. Institute better mortality controls (e.g., MSY as a limit) for major fisheries in the industrializing world and on the high seas.
3. Initiate more basic mortality control measures for commercial-scale fisheries in the developing world.
4. Test and scale workable, community-based solutions to the massive pressure on coastal fisheries, particularly in the high biodiversity regions of the developing world.
5. Safeguard the last pristine and precious places in the ocean from further exploitation.

Figure 3-3

Policy-market dynamics for creating change

Market forces, resource rights, and governance can combine to stimulate change (*a simplified process diagram*)

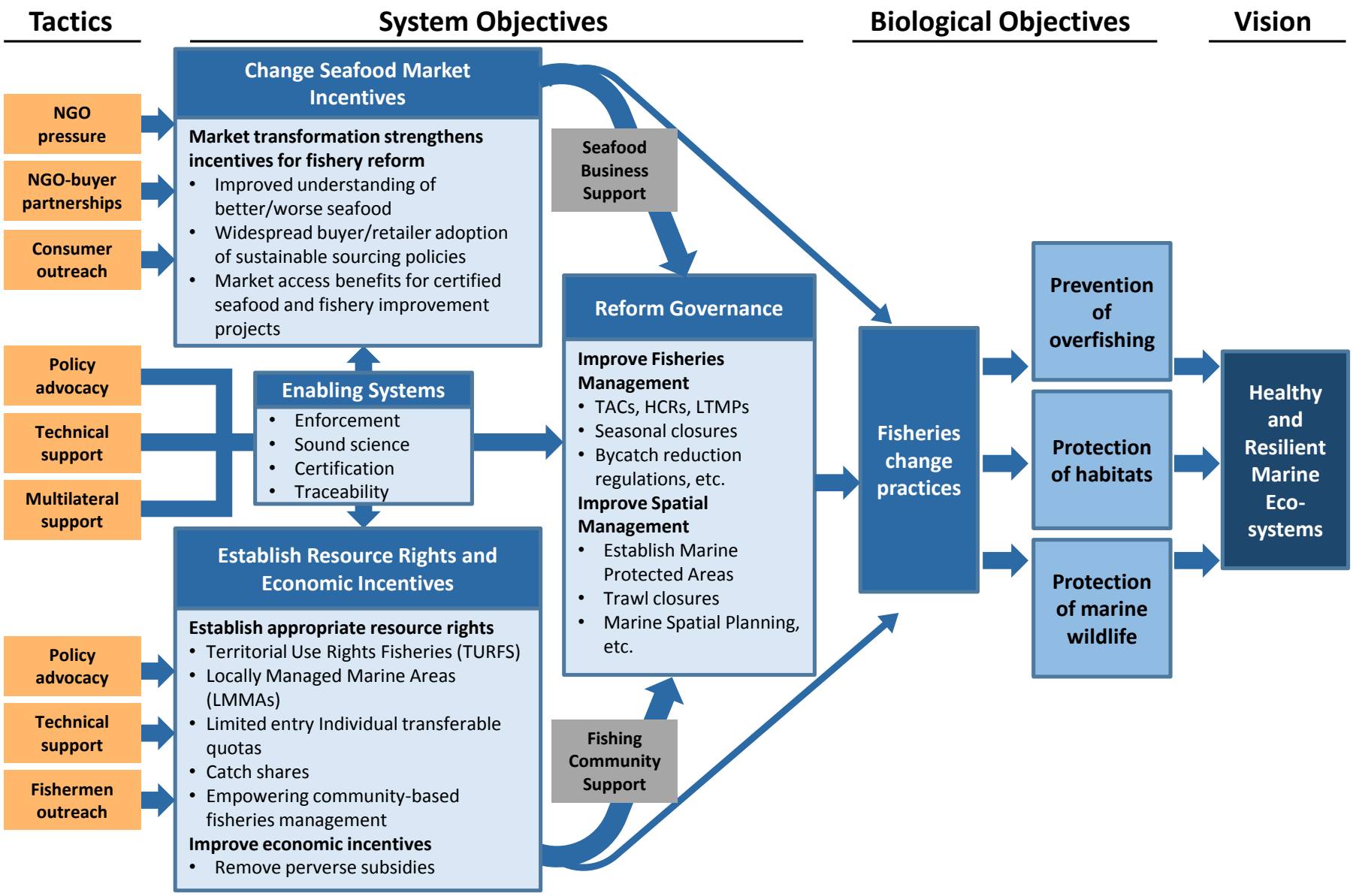
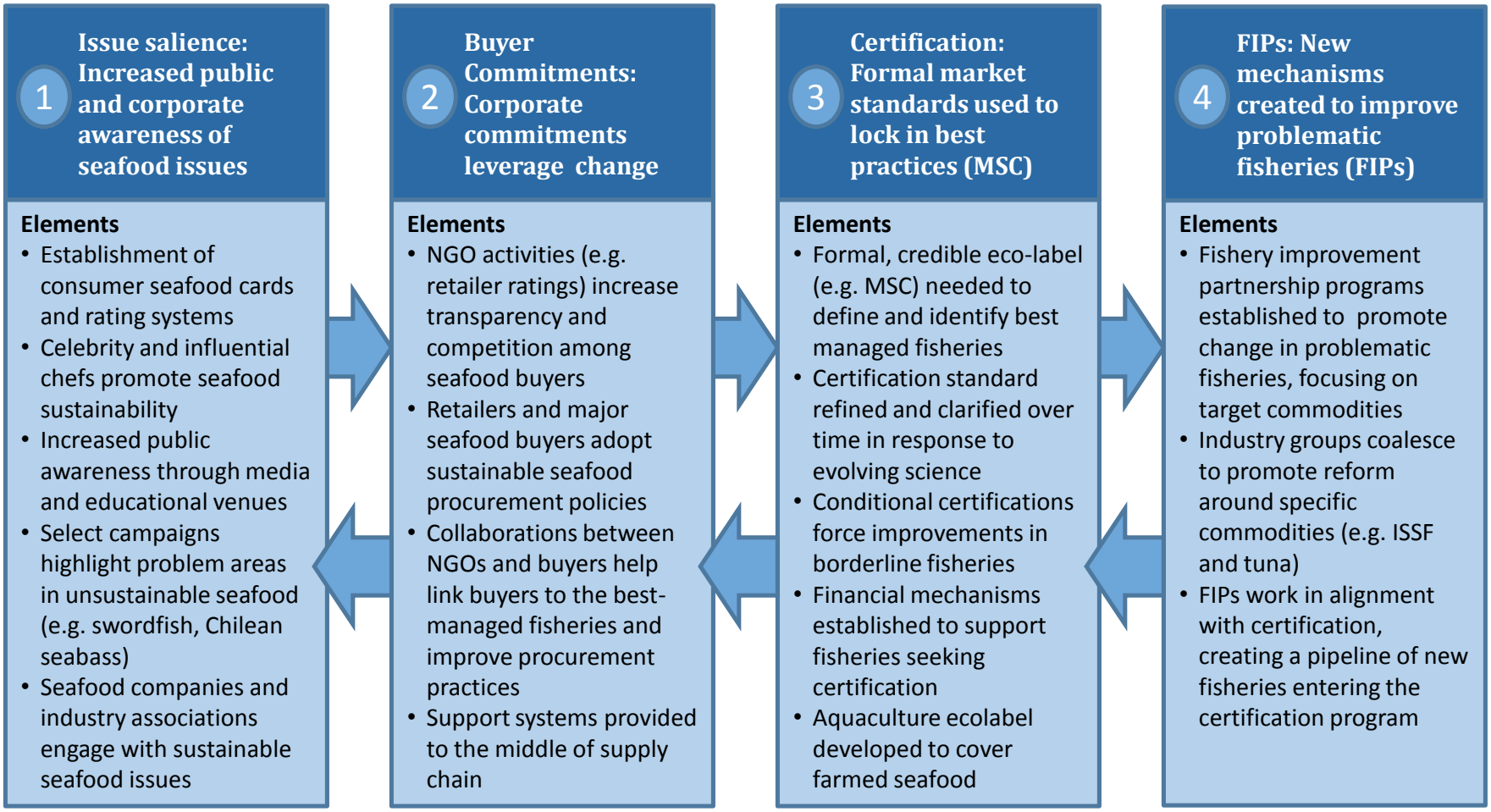


Figure 3-4

The seafood market transformation effort to date

Market forces help to drive change (a simplified process diagram)



Collectively, these focus areas will help to prevent global overfishing. Each focus area requires the complementary use of basic tools (policy, market transformation, protected areas, intergovernmental activities, and technical capacity building) as the essential building blocks of a truly global strategy for the conservation of marine resources.

In this chapter, we first describe these essential tools. We then illustrate how they are likely to be applied to each of the objectives listed above.

Basic tools required

Policy reform. There can be no lasting solution to the global fisheries dilemma without widespread changes to fisheries policy. The national, regional, and local policies and regulations that govern fisheries are the cornerstones of sustainable fisheries, and need to change in order to address the challenges in the water. Policy reforms should focus on progressively implementing the suite of solutions outlined in Chapter 2. There is no simple recipe for creating these reforms. Often, durable policy changes require long-term efforts to establish cooperative relationships across multiple sectors. The engagement of fishermen, non-profits, industry, community, and government leaders can be critical to help shape and build broad consensus for reforms. The changes that we anticipate in fishery policy over the next decade depend heavily on the level of fishery management capacity. For example:

- In the more developed regions, such as Europe and North America, we anticipate continued efforts to build on recent progress toward ending overfishing and rebuilding stocks. In tandem, the push toward limiting the ecological effects of fisheries (bycatch, habitat effects, lower TACs for LTLF) will continue to grow. Both regions will need to better grapple with the management challenges associated with unassessed fisheries, and begin to integrate fisheries with broader ecological concerns (climate, spatial planning, coastal development, etc.).
- Many middle income countries, such as those in South America, meet the tests of institutional integrity, and will greatly benefit in the next decade from improved policies around harvest control rules, capacity management, and TAC level. Similarly, RFMOs will move to shore up their decision making rules, transitioning away from consensus-based structures, and focusing on better measures to improve stock management and bycatch reduction.
- Many developing countries will make advances in the next year to develop the fundamentals of fishery management, particularly systems for limiting access and instituting mortality controls. For example, China is well positioned to make huge strides over the next decade: the country has the basic management capacity and some political will, but currently has very weak implementation of its fisheries policies.
- In addition to working to promote the implementation of better fishery policies and regulations globally, the broader conservation community should pay close attention to the regulation of the world's largest fisheries. In particular, major single-stock fisheries in middle income countries (e.g., anchoveta in Chile and Peru, jack mackerel in Peru and Chile, hake and hoki in Argentina, small pelagics in South Africa, sardines and shrimp in Mexico, hake and mackerel in Namibia, skipjack tuna globally, Russian pollock, and Japanese anchovy in China) represent a huge share of global landings, and could serve as a examples of better management in these countries. The effective implementation of strong TACs, and catch shares in the form of ITQs and cooperatives to help implement those TACs, in the top industrialized fisheries would be a major advance for fisheries in many parts of the world.

Market transformation efforts. [Figure 3-4, please see page 72] The seafood market will have a powerful role to play in encouraging improvements in fishery management, particularly in parts of the world where management fundamentals are in place, but entrenched interests prevent basic reforms. Over the last 15 years, the power of the market has served as a catalyst for certain fishery reforms. We now have the ability to define and certify sustainable seafood, educate consumers, engage businesses, and channel that interest toward fishery reform. Soon, a critical mass of engagement will be reached, with major markets making sustainability a condition of entry. We anticipate that Marine Stewardship Council (MSC) certification of wild seafood is likely to grow to 15-20% of global fisheries, temporarily reaching a plateau at that level. Corporate engagement will deepen in North America and Northern Europe, while making inroads into Japan, Southern Europe, and more diffuse markets. Consumer awareness will slowly take root in core markets. Engaged companies will contribute to the growth of the fishery improvement project (FIP) approach, and will become systematically connected with certification. Industry-led FIPs are likely to emerge in key commodity sectors (tuna, whitefish, and salmon, expanding into small pelagic, crab, and shrimp), effectively driving improvement in fisheries management across a wide range of commodities. [See Appendix 5 – Commodities] The growth of the MSC and FIPs will attract more scrutiny in the coming years, necessitating efforts to maintain the credibility of these programs. Aspects to this work include improving traceability, ensuring standards represent the best available science, and documenting improvements on the water in participating fisheries.

With market transformation work in its infancy, many questions remain about the limits of its ability to drive change on the water. Initial studies have been undertaken to document what impact the MSC is having on fisheries, but more work is needed. Similarly, there is an open dialogue about the extent to which current seafood market approaches will be able to influence fisheries in the developing world. Answers to these questions will hopefully become clearer in the next few years, and will help define the appropriate role of market transformation in improving global fisheries.

In addition to certification and improvement projects, there is burgeoning interest in exploring the potential of the financial sector to help drive change on the water. This might entail bringing together financial institutions to develop minimum standards for potential investments, an organized effort to provide bridge funding to fisheries during rebuilding periods, or financial incentives to mitigate the cost of purchasing new gear technology. Although there is interest in collaborating with the financial sector to drive change, the conservation community does not yet have a clear understanding of the tools, their appropriate role, or their overall potential.

Protected areas. No-take areas, especially when combined with traditional territorial use rights, are an essential tool in coastal areas with complex coastal fisheries and weak management capacity (i.e., much of Southeast Asia and Africa). These strict no-take areas should be integrated into a broader network of marine protected areas that restrict some, but not all types of activities, together constituting a network of sustainably managed seas. However, protected areas of meaningful size have been relatively expensive, easily costing $500,000 per year or more to administer, and difficult to scale. Thus, while there are numerous protected areas on paper, most of these areas have been exploited nonetheless. It is imperative that the conservation community help maintain the current portfolio of protected areas (e.g., in the Coral Triangle, Eastern Tropical Pacific Seascape (ETPS), and Mesoamerican Barrier Reef System (MBRS)), while expanding

that set wherever financially and logistically possible. While we expect that MPAs in the developed world will continue to expand slowly and opportunistically (e.g., in California, Oregon, and in the E.U.), it will be critical over the next decade to establish protective measures for the few areas that remain relatively untouched by fishing and are under developed world jurisdiction, and ideally to establish a fishery refuge in the Arctic. The feasibility of implementing large-scale MPAs on the high seas remains a challenge under the current legal framework, and will require a long-term political effort to bring about. In 2010, the world's first high seas MPA was created in the Southern Ocean and since that time several more have been created, including OSPAR's protected areas in the Mid-Atlantic. Continued progress will require ongoing efforts at the international, RFMO, and state level. In the developing world, the historical effort directed toward establishing MPAs is beginning to be refocused on efforts to maintain the current portfolio and promote CBFM in conjunction with the current protected areas. Specifically, the conservation community is beginning to show interest in a wider-spread effort to build and replicate closed-access fishery management around MPAs, i.e., TURF-reserve systems.

Major improvements in the intergovernmental context. There are a series of ongoing intergovernmental discussions and negotiations that have a heavy influence on the future trajectory of fisheries. A continued focus on efforts to reduce fuel and vessel construction subsidies would help to limit the exploitation of economically marginal stocks in open access fisheries. [See Appendix 8 – Subsidies Review] These conversations are already occurring through the Doha round and OECD, and face uncertain prospects of success. Similarly, fishery access agreements (FAAs) have been criticized for transferring excess capacity to the developing world. We recognize that there are multiple other pathways for that capacity to be utilized (e.g., flags of convenience, host companies, and IUU), and well-designed, enforced FAAs can provide a vehicle to help build better fishery management, particularly in Africa. Helping governments to understand and structure supportive FAAs is an important area of engagement. The conservation community should remain supportive of these efforts, and vice versa, looking for opportunities to help promote best practices and share findings across agencies and organizations. As the trade of seafood becomes ever more global, improving seafood traceability requirements will help prevent IUU fishing and can also enhance market transformation efforts. The recent EU seafood traceability legislation and the Lacey Act, which bans the trade on illegally harvested wood in the United States, are models that can be proliferated and built upon.

Technical capacity building. Fishery managers in many industrializing and developing countries work in a data-poor environment. Not only is the stock status of most fisheries unknown, but there is virtually no information on the basic economics of the major fisheries. In addition, there is often limited knowledge regarding the design and implementation of even the most basic means of mortality control, such as registration and permitting systems, adaptive effort restrictions, HCRs, ITQs, and effective MPA design. In the absence of such data and expertise, fishery management is generally weak. Development agencies and other multilateral institutions play an enormous role in the growth of fishery management capacity in many parts of the world (e.g., United States Agency for International Development (USAID), Japan International Cooperation Agency (JICA), Department for International Development (DFID), Deutsche Gesellschaft für Internationale Zussammenarbeit (GIZ), Global Environment Facility (GEF), World Bank). This is a long term, resource

intensive effort being pursued in many parts of the world and must continue. To bolster these efforts, the conservation community can help provide technical capacity in areas that have the will, but not necessarily the resources, to manage their marine resources effectively. There is an urgent need to provide world-class bio-economic fishery information and management advice in service to developing countries (as requested by them). There is a need for countries to build practical policy and decision-making capacity around fisheries management, and to accelerate peer-to-peer learning across developing and developed countries. Capacity building efforts should typically work strictly in service to developing countries, work on demand, and ask only for a strongly collaborative environment in their client countries as payment for its services. This would help create enormous economies of scale and expert guidance for their development contributions in a particular sector, in this case, fisheries.

In addition to developing the expertise of fisheries managers, the conservation community should investigate supporting the advancement of technological solutions for fisheries management. Developing low cost methods for assessing stocks, accurately tracking landings, enforcing regulations, and reducing bycatch will only support better fisheries management. These tools would be particularly useful if they could be deployed cost-effectively in developing world fisheries.

Applying these tools to achieve the five highlighted focus areas

As previously mentioned, this chapter will outline five highlighted focus areas which, collectively, would help to prevent global overfishing. Each focus area requires the complementary use of the tools listed above (policy, market transformation, protected areas, and intergovernmental activities) as the essential building blocks of a truly global strategy for the conservation of marine resources.

Figure 3-5

Major fishing nations in the developed world

Country	Importance		
	2008 landings (tonnes)	% of global landings	Stock health and trajectory
EU	4.9M	6.5%	N. Europe rebuilding; S. Europe poor, institutional weakness
USA	4.0M	5.3%	Federal stocks rebuilding; exception for HMS, anadromous, and coastal stocks
Japan	4.0M	5.3%	Mixed stock status for both federal and cooperative system
Norway	2.4M	3.2%	Healthy. Strong management, ITQs
S. Korea	1.9M	2.5%	Very limited data – federal and coop system appears to be working
Iceland	1.3M	1.7%	Mostly healthy. Strong management, ITQs
Taiwan	1.0M	1.3%	No data
Canada	0.9M	1.2%	Pacific coast healthy; overfishing in the Atlantic
New Zealand	0.5M	0.6%	Healthy. Strong management, ITQs
Australia	0.2M	0.2%	Mostly healthy. Strong management

Source: FAO FISHSTAT marine landings, 2008

CHAPTER 3: A GLOBAL AGENDA FOR SUSTAINABLE FISHERIES

Focus Area 1

Developed World: Lock in existing gains in responsible fishery management, and gradually transition toward an EBFM focus on habitat and marine wildlife

Objectives

In pursuing sustainable fishing globally, it will be imperative to continue to build momentum where the conservation community has made the greatest strides, while looking to export those best practices to the rest of the world. Continued efforts in the developed world will remain a major focus area in this global agenda for sustainable fisheries. The conservation community is seeking to lock in existing gains in fishery management, extend responsible management to fisheries that are still being overfished, and gradually transition toward an EBFM focus on habitat and marine wildlife.

For all assessed fisheries, there should be an end to overfishing. Performance-based management systems should be introduced into all major fisheries in the developed world, and we anticipate a transition to a more ecologically-based management model which explicitly includes greater consideration for the bycatch, habitat, and food web effects of fisheries. There must also be a solution set provided to small-scale coastal fisheries in the developed world. Community-based management or co-management clearly has a role and has been applied in developed countries like Japan, France, and Spain. Developing successful fisheries management will not only help rebuild fisheries in the developed world, but also provide models which can be transferred to other parts of the world. The transferability of best practices from the developed world has been seen in many instances, for example the habitat protection approach used in Alaska and the West coast of the United States became the basis for treaty negotiations for freezing the footprint of the North Pacific RFMO.

The top ten developed fishing countries, all of which have strong institutional capacity and integrity, account for 25% of global fishery landings. These countries have made substantial progress over the last 20 years, in no small part due to the dedicated efforts of the conservation community. However, many still operate under politically influenced quota allocation systems that tend to lead to overharvesting. This dynamic should be broken by mandating decision-making systems that rely on some combination of HCRs, long-term management plans (LTMPs), and mandatory TAC-setting and rebuilding requirements. Combining these three elements will set fisheries in these countries securely on the pathway to recovery.

Concentration of Effort

The U.S. and E.U. are likely to continue to be prioritized in efforts to locking in existing gains, extending responsible management to fisheries that are still being overfished, and attempting to shift management towards EBFM: they are moving toward rebuilding and have relatively strong NGO capacity. Both are among the top-five fishing regions, each with more than 5% of global landings. While the situation in the U.S. is relatively strong and improving, European fisheries have been a disaster, though promising signs are emerging. Greater attention will hopefully be paid to Europe's progress over the next five to ten years.

In addition, Canada is an important fishing country, with significant landings (0.9 MMT), strong NGO and governance capacity, and considerable room for improvement (particularly in the Atlantic). In North Asia, Japan, South Korea, and Taiwan are all major fishing nations (4.0 MMT, 1.9 MMT, and 1 MMT, respectively) with room to significantly improve fishery management. The current capacity of the conservation community to promote fisheries reform in Northern Asia is anemic. The environmental community will need to ramp up its presence in Northern Asia in order to react swiftly to opportunity in these countries (e.g., an active political debate on reform). Norway, New Zealand, and Iceland all have relatively strong fishery management systems already. Over the next decade, efforts in those countries will presumably also focus on the transition to EBFM [Figure 3-5].

Focus Area 1 – Developed World

Theory of Change

Within the broader conservation community, close coordination of fishery policy advocacy with seafood market transformation efforts will be critical to achieve appropriate fisheries reform in the developed world.

Policy Reform

- **Overall:** The conservation community is focused on management guidelines that improve fishery productivity, species recovery, and habitat protection. Harvest control rules, mandatory rebuilding requirements, and long-term management plans are all effective methods for separating management decisions from annual allocation fights. These rules ought to be straightforward and transparent, establishing guidelines for TACs or other output controls using MSY as a limit in a reasonable time frame. Adaptive input controls are also acceptable tools for many fisheries if they truly lead to effort modifications in response to new (or real-time) changes on the water. Supplementing these rules with a strong push toward catch share systems (ITQs, cooperatives, IVQs, TURFs, etc.), is helping to shore up the economic performance of the fishery and improve compliance with TACs during the challenging rebuilding period.[93,94]

- **Europe:** The new CFP and member states' policies will hopefully be designed to include performance-based fisheries management policies. The required interventions need to address a representative diversity of European fisheries. Specifically, interventions should include the expanded use of LTMPs, greater regionalization of decision-making in order to break the political deadlock, the increased use of catch shares or "transferable fishing shares" (a term used by the European Commission), and a discard ban. In Northern Europe, the main focus should be on the design and implementation of performance-based solutions to the management challenges of the mixed stock fisheries, particularly given the potential for a European-wide discard ban. In many northern member states, pilot fisheries are already identifying the benefits of catch quota management and its attendant improvement in monitoring and enforcement. Southern Europe currently faces broader economic issues that will make tangible progress on fisheries reform more challenging, but the groundwork for future progress can be laid in the next five years with focused work in fisheries in leading member states, such as Spain, France, Italy, and Greece. The current lobbying campaign around the CFP will ideally transform into an implementation effort at the national level that will require equal, or greater, resources than currently dedicated to the policy reform effort. [See Appendix 7 – Regional Fishery Summaries]

- **U.S.:** With the Magnuson-Stevens Act (MSA) up for reauthorization in 2013, policy advocacy is likely to focus on protecting the conservation and management provisions already won, including rebuilding timelines.[95] This will be coupled with continued on-the-water implementation of performance-based fishery management, including catch shares for most major U.S. fisheries, and new solutions to deal with recreational fishing sectors and small-scale near-shore fisheries. Management solutions that more directly tie fishermen's financial or other interests to the long-term health of fisheries can help shift the political dynamic such that fishermen are more likely to support science-based TACs that contribute to fishery rebuilding. These regional advances can be leveraged in national policy advocacy to help protect the MSA and support federal funding (including appropriations) for its implementation. [See Appendix 7 – Regional Fishery Summaries]

[93] Recent analysis of catch chares shows that fisheries under catch shares show less catch variability around TAC. Melnychuk, M.C., et al. 2011. Can catch share fisheries better track management targets? Fish and Fisheries. DOI: 10.1111/j.1467–2979.2011.00429.x

[94] Although catch shares improve the overall economics of fisheries, the unwinding of overcapitalization often results in heterogeneous distribution of the economic benefits with some groups actually being worse off under catch shares. This can create political backlash and social impacts (i.e. loss of fishing jobs, changed economics for port communities, etc.).

[95] The focus of MSA advocacy will be on protecting and advancing the conservation gains already won, but there will be other important advocacy such as enhancing community provisions related to catch shares.

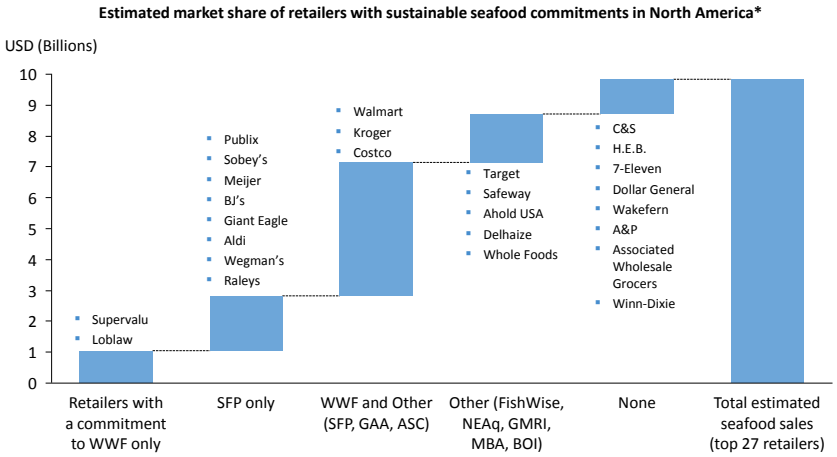
Figure 3-6

Important areas to address bycatch

	Seabirds	Turtles	Whales	Other Cetaceans	Sharks
Areas	• Southern Ocean longline fleet: especially tuna vessels in Taiwan and Japan (RFMO)	• Open ocean longline fisheries in Mediterranean and E. Pacific	• Directed whaling/IWC	• Fisheries with interactions with threatened populations of small cetaceans, especially gillnet fisheries (e.g., Vaquita in the GOC, Irawaddy dolphins in SE Asia, Dusky dolphins in Peru)	• Global fisheries (longlines, gillnets, trawls) – mainly coastal developing world fisheries; pelagic longlines may be biggest gear threat
	• Coastal longline fleets in Chile, Uruguay, S. Brazil	• Coastal trawl and longline fisheries in Mediterranean and E. Pacific	• Right whale – US/Canada lobster and fixed gear		
	• N. Atlantic demersal longlines for hake and ling (EU, Norway)	• Gillnets and longlines in SW Atlantic	• North Pacific Right Whales – fixed gear and gillnets		
	• S. Africa and Namibia longlines and trawls	• Longlines and trawls in NW Atlantic			
	• Argentina trawls	• Tropical shrimp trawls (especially developing nations)	• Mediterranean Sperm Whales – Pelagic driftnets		
Solutions	• Streamers, line weighting, night setting, offal, closed areas, observers, enforcement	• Circle hooks, TEDs, bycatch quotas; + observers and enforcement; performance incentives. No good solution for gillnets	• Reduce whaling effort via IWC; weak links and line weighting	• Marine reserves/seasonal closures • Gear restrictions (i.e., bans on gillnets/driftnets) • Pingers	• Ban on finning and trade restrictions; protected areas; performance incentives; need more gear advances to address bycatch – workshops

Figure 3-7

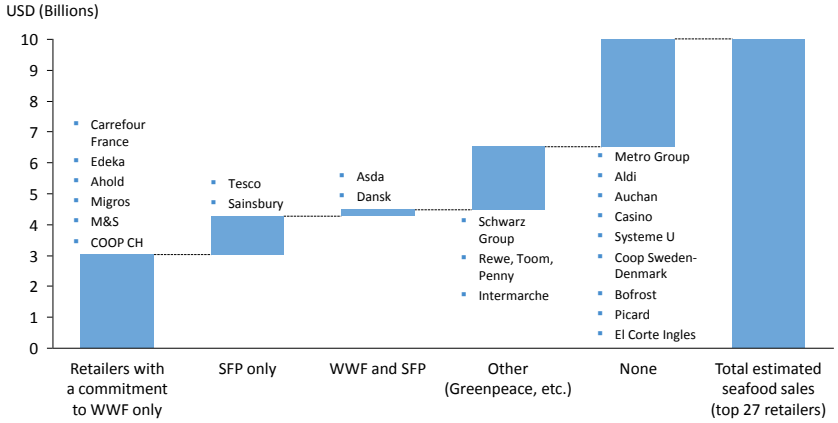
Much of the retail and food service industry in Europe and North America has adopted sustainable seafood commitments



Source: Supermarket News and Sustainable Fisheries Partnership data
* Excludes MSC commitments

Figure 3-8

Much of the retail and food service industry in Europe and North America has adopted sustainable seafood commitments



Source: Supermarket News and Sustainable Fisheries Partnership data
* Excludes MSC commitments

Focus Area 1 – Developed World (continued)

EBFM: Fishery management systems in the developed world increasingly feature an array of protections for the broader ecosystem, such as the consideration of vulnerable marine wildlife populations, restrictions on the bycatch and discard of non-target species (e.g., weak stocks), and greater safeguards for marine habitats, such as no-trawl areas, essential fish habitat designations, and MPAs. EBFM principles are already in place in places like Alaska [See Appendix 4 – Ecosystem Based Fisheries Management], the North Sea, and Georges Bank, but significant uptake of EBFM will require policy changes (e.g., MSA), continued advancement in science, and additional resources. Despite these challenges, as we rebuild stocks in North America and Europe, we expect to see an increasing focus on EBFM, including:

- **Habitat protections:** Both the U.S. MSA and the E.U.'s CFP need stronger provisions for habitat protection. In the long term, the Essential Fish Habitat provisions of the MSA, and the analogous components of the CFP will need strengthening, but these changes may be unlikely within the next five years. In the meantime, improved application of existing provisions can expand the coverage of protected areas and no-trawl zones, particularly for critical habitat types (e.g., deepwater canyons). When paired with dedicated access fisheries management (i.e., catch shares), these protected area measures can reduce the overall impact of fisheries on habitat. Habitat rebuilding efforts (e.g., in estuaries or shellfish reefs) also have an important role to play. Today's promotion of spatial management systems will bear fruit for habitats in the long run, including the new U.S. National Oceans Policy; state-based work in Massachusetts; Canada's Pacific North Coast Integrated Management Area (PNCIMA); and MPA development in California, Oregon and the E.U.

- **Bycatch:** Turtles, seabirds, sharks, and cetaceans are highly vulnerable to bycatch, and their mortality is now concentrated mainly in developing world and high seas fisheries outside the jurisdictions addressed in this section. Efforts in the developed world are likely to focus on reducing the high level of seabird mortality associated with trawl fisheries in the North Atlantic, decreasing shark mortality (e.g., through bycatch limits and gear modifications), and a continued focus on reducing turtle mortality. [Figure 3-6] Performance-based approaches that provide incentives for compliance with strict bycatch limits show promise and should be tested in key fisheries. Efforts to foster the design and deployment of innovative gear designs that reduce bycatch should also continue. As EBFM sophistication grows, groups may begin to explore the integration of bycatch into ecosystem management plans.

- **Reduced TACs for Low Trophic Level Fisheries:** Establishing ecosystem-based catch limits for LTLF would leave a greater amount of food in the marine ecosystem for natural predators including larger fish, marine mammals, and seabirds. The LTLF fish work is likely to continue through ongoing campaigns around Atlantic herring and menhaden in the U.S. and appropriate spatial distribution of krill TACs in the Antarctic. On the market side, MSC is in the process of rolling out new guidelines for LTLF that will help to support and expand this market pressure around this initiative. Further efforts to reduce TACs and improve management of LTLF may be explored. [See Appendix 4 – Ecosystem Based Fishery Management]

Market Transformation

The North American and European seafood market transformation initiative has enshrined a series of rating and certification systems that have persuaded much of the retail and food service industry to adopt sustainable seafood commitments. [Figures 3-7, 3-8] This trend should be firmed up to the point where responsible fisheries management becomes the de facto condition of entry for seafood into these markets. Buyers in core markets (North America, Northern Europe, Australia, New Zealand) are systematically making stronger commitments: graduating from basic chain of custody certification and dropping the worst products to moderate measures, such as the adoption of a

Figure 3-9

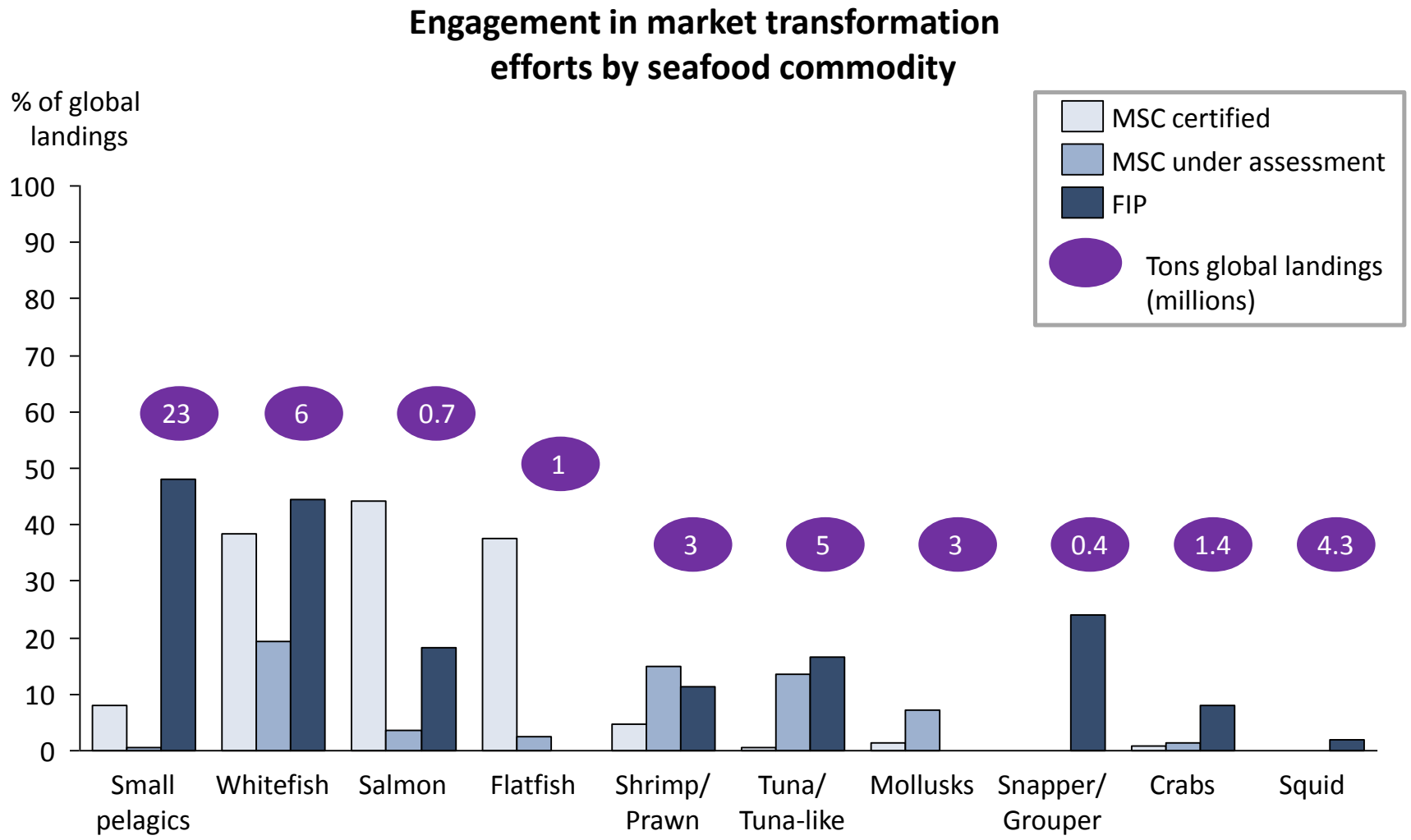
Major markets for the sustainable seafood movement

Area	Consumption* (% global fish consumption)	Strategic importance	Stage of CSR in marketplace	Market type
Northern Europe	6M tonnes (5%)	Very affluent, import market	Strong CSR and highest levels of seafood engagement	Core market
US/Canada	8.2M tonnes (7%)	Very affluent, import market	Strong CSR and growing seafood engagement	Core market
Australia/NZ	0.6M tonnes (0.6%)	Small, but rich	Strong CSR and high levels of seafood engagement	Core market
Japan	7M tonnes (6%)	Very affluent, import market with Asian influence	Strong CSR, but limited salience of seafood	Expansion market
Southern Europe	5M tonnes (4%)	Large market and reasonably affluent	Some CSR development, but limited seafood CSR	Expansion market
China	34M tonnes (29%)	Major processing hub and global importer	Minimal CSR penetration	Potential future expansion market
Mexico	1.3M tonnes (1%)	Dominant Central American market	Minimal CSR penetration, but select companies progressing	Potential future expansion market
Brazil	1.3M tonnes (1%)	Most receptive SA market; regional seafood hub	Minimal CSR penetration, but retail engagement on other commodities	Potential future expansion market
South Africa	0.4M tonnes (0.3%)	Most receptive African market	Active adoption of some CSR activities/standards	Potential future expansion market
Korea, Taiwan, Singapore	3.8M tonnes (3%)	Large seafood hub within Asia	Relatively advanced CSR, but limited seafood salience	Potential future expansion market
Russia, E. Europe	5M tonnes (4%)	Domestic interest could build Russian fishery interest	Minimal CSR penetration, but select companies progressing	Potential future expansion market

* FAO apparent consumption data. Includes aquaculture

Figure 3-10

Current level of FIP engagement is an indicator of future levels of MSC certification

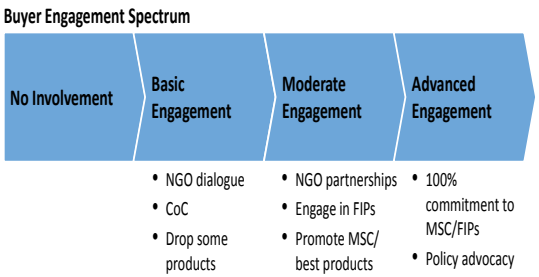


Note: See Commodities Appendix for complete commodities analysis

Focus Area 1 – Developed World (continued)

Figure 3-11

Buyers in core markets need to be systematically pushed and pulled towards advanced levels of engagement on sustainable seafood



Note: See Priorities Appendix for further detail and examples

sustainable seafood policy, certification for private labeled products, and participation in fishery improvement projects (see next area of focus), and ultimately to relatively advanced levels of engagement (e.g., 100% commitments, policy advocacy positions, funding work). [Figure 3-11] At the same time, buyers in expansion markets (Japan, Southern Europe, Brazil, and multinational corporations) are slowly entering into the initial stages of engagement. Moving forward, the main components of the conservation community's effort around market transformation involve:

1. Maintaining the MSC as a trusted seal of approval for fisheries globally to increase the pressure on fisheries and management agencies
2. Applying external NGO pressure on retailers and other major buyers of seafood (e.g., retail ranking efforts), and supporting that corporate engagement by helping to guide and celebrate responsible buyer procurement (e.g., buyer outreach efforts and partnerships)
3. Developing a coordinated series of efforts around FIPs to drive improvement in problematic fisheries (discussed in the next focus area)[96]
4. Cost effectively building consumer awareness and increasing the salience of sustainable seafood to consumers and retailers in expansion markets (e.g., aquaria outreach efforts; work with media and celebrity chefs; and joint-marketing efforts with retailers)

This engagement will help channel the top quartile of the world's seafood buying power toward sustainability. [Figure 3-9, on previous page] MSC will continue to play a critical role in locking in the responsible management of major fisheries within the developed world. With 10% of global wild fish under MSC certification or under assessment, we anticipate that up to a fifth of global wild fishery production (by volume) could be certified by 2020, including the majority of landings in the U.S., Canada, Iceland, Norway, and New Zealand, and a substantial minority of landings in the E.U., Japan, and Australia.[97] The majority of global whitefish and wild salmon fisheries should be certified within five years, as well as the best available tuna, warm water shrimp, crab, and small pelagic fisheries (but probably less than 20% of these commodities). [Exhibit 3-10 on previous page] [See Appendix 5 – Commodities]

Over the next five years, this market transformation effort will help lock in the best practices already present in the world's best, large-scale fisheries. As fisheries become certified, emerging evidence suggests that they will realize incremental improvements in environmental performance.[98] As MSC's market clout grows over time and as its criteria and standards mature (e.g., LTLF and ecosystem impacts), it should be expected to trigger greater improvements in certified fisheries. For the near future, the MSC's reach should be expected to be concentrated in fisheries in the developed and industrializing world with strong management institutions in place.

Over the next five to ten years, the majority of the Northern Europe, North America, Australia, and New Zealand retail

[96] FIPs use the buying power of seafood markets to promote reform in select problematic but fixable fisheries. The FIP approach generally involves NGOs coordinating the purchasing power of groups of engaged buyers, effectively delivering an ultimatum to fisheries to improve their management practices or risk losing important markets. FIPs then work collaboratively with fisheries to adopt the needed reforms. In some FIPs, industry has taken the lead in the reform efforts with NGOs playing a watchdog role.

[97] www.msc.org; May 30, 2011

[98] The MSC has a commissioned a study by MRAG to document this trend. While the study has not yet been published, draft findings suggest improvements are occurring over the pre-assessment and certification process.

markets and contract food service providers will make substantive sustainable seafood commitments. This should be supplemented by significant commitments from a minority of the retail market in Japan and Southern Europe, with Brazil, South Korea, South Africa, Taiwan, and a handful of other countries as a next tier of engagement. Additional commitments will come from a handful of multinational brands (hotel chains, retailers, food companies) that operate in multiple countries. In concert with policy pressure, this level of market engagement should be sufficient to solidify the new climate of responsible decision-making in the developed world. [See Appendix 6 –Prioritization Screens]

Intergovernmental Pressure

A complementary element of the reform process will be efforts to reduce perverse subsidies in the fishery sector, particularly in North Asia and Europe. As of 2003, Europe spent about $3 billion per year on "bad" (potentially capacity enhancing) subsidies. In 2007, Europe banned vessel construction subsidies. However, port construction and port expansion subsidies still need to be reduced. Asian countries spent approximately $11 billion per year on bad subsidies in 2003. A similar commitment to ban vessel construction and modernization subsidies is required in developed Asian countries, such as South Korea and Japan, along with efforts to reduce fuel subsidies. Redirecting funding from these harmful subsidies to improving fisheries management could result in significant improvements in fishery management capacity. (See Campaign 3) [See Appendix 8 – Subsidies Review]

In addition, developed countries should adopt more stringent policies requiring seafood traceability and reducing illegal product (i.e., IUU) within fishery supply chains. In 2010, the E.U. implemented regulations to prevent IUU seafood by establishing a certification scheme covering all imports of fishery products. This policy should be enforced, strengthened over time, and replicated in other critical markets, including the U.S. (potentially using the E.U. regulations or the Lacey Act as a model).

Other international agreements, like the Port State Measures Agreement and Global Record of Fishing Vessel Registry, have been helpful tools in rooting out IUU and understanding the global fishing fleet, and could use a boost in support.

Existing Capacity

In the U.S., Europe, and Canada, the conservation community's capacity for policy and demand-side work is relatively deep. While there is always considerable room for improvement (e.g., incorporating greater fishery management expertise and economic analysis into the effort), the fundamentals are in place. In contrast, North Asia currently has almost no NGO capacity involving fisheries reform or market engagement. [See Appendix 7 – Regional Fishery Summaries]

- United States – Strong: The U.S. has the world's largest, most diverse, and best funded community of marine conservation-focused NGOs. This group has helped transform fisheries management in the U.S., both through refining the MSA and working at the council level to effectively implement it. There is a large group of actors at the Federal level: Marine Fish Conservation Network serves as a policy watchdog; Pew, Natural Resources Defense Council (NRDC), Environmental Defense Fund, Marine Conservation Institute, The Nature Conservancy, Oceana, and Ocean Conservancy each run several campaigns, including MSA protection, habitat protection and EBM work; and several regional groups like the Gulf of Maine Research Institute (GMRI) and Conservation Law Foundation (CLF) in New England and Ecotrust in the Pacific Northwest are important advocates for fisheries reform. Catch shares have been a major focus of foundations and NGOs during the last few years. Environmental Defense Fund (EDF)

Focus Area 1 – Developed World (continued)

has been the leader on catch shares, but a host of organizations (e.g., Ocean Conservancy, TNC, and Cape Cod Commercial Hook Fishermen's Association (CCCHFA)) have made important contributions. Protected area work has also received a comparable level of investment, and has involved a host of regional NGOs. The bulk of this spending was on the California Marine Life Protection Act, but investments have also been made in Oregon, Alaska, and Massachusetts. Seafood market transformation efforts are well established in the U.S., with major NGOs including WWF, Sustainable Fisheries Partnership (SFP), MSC, Monterey Bay Aquarium, New England Aquarium, FishWise, Blue Ocean Institute, Pew, and OC, among others. Each is playing multiple roles, pushing market transformation through certification, consumer awareness, and major buyer initiatives. The current capacity seems sufficient to achieve the goals of this focus area, but increased coordination among the above players will likely enhance and accelerate several efforts. Additionally, there is an urgent need to implement future habitat protection efforts (no-take areas, no-trawl zones, and the implementation of the National Oceans Policy).

- Canada – Strong: The capacity in Canada is also relatively strong. On the West coast, Tides, WWF, Turning Point Initiative, Living Ocean Society, and others are active with the PNCIMA area-based management process. Other major campaigns include salmon protection and management (David Suzuki Foundation, Ecotrust Canada, Tides Foundation, Ecotrust, Wild Salmon Center), habitat protection (Oceana), and offshore drilling advocacy. The East coast of Canada has received relatively less attention. WWF has been a steadfast supporter in the region with efforts to rebuild cod fisheries, protect right whales, and shark conservation, while Ecology Action Centre (EAC) has a supporting presence on policy and market issues. In Canada, the sustainable seafood movement is almost as strong as it is in the U.S. WWF, DSF, Greenpeace, Sea Choice, MSC, SFP, and others all promote market transformation in Canada.

- Europe – Moderate: The recently increased level of effort around fisheries policy at the E.U. level appears to be sufficient. Pew, WWF, Oceana, and Greenpeace have been central to marine conservation efforts, with a focus on reform of the CFP. Other organizations, including BirdLife International, have also been engaged in the CFP process. The efforts to date on CFP reform played a key role in the development of long-term management plans. To ensure that the CFP is implemented faithfully, NGOs will need to ramp up their efforts at the national level, and experts predict significant capacity gaps in some countries. The Seas at Risk Coalition already includes a healthy list of organizations working for the protection of the marine environment, including Bond Beter Leefmilieu and the Sea First Foundation (Belgium), Levende Hav (Denmark), Surfrider Foundation Europe (France), BUND (Germany), Voice of Irish Concern for the Environment (Ireland), Legambiente (Italy), Waddenvereniging (the Netherlands), Stichting De Noordzee (the Netherlands), Norges Naturvernforbund (Norway), Liga Para a Protecção da Natureza (Portugal), Grupo de Estudos de Ordenamento do Território e Ambiente (Portugal), Svenska Naturskyddsföreningen (Sweden), and the Marine Conservation Society (UK).

  In addition to policy and protected area work, there is very active market transformation work happening in Europe. The MSC has certified or is assessing a remarkable 30% of fisheries landings in Europe. Other organizations, such as WWF, SFP, Greenpeace, MSC, and the Seafood Choices Alliance, are also important actors in advancing market transformation. However, the implementation capacity of NGOs, especially in the member states, is highly variable.

- North Asia – Weak: In potential expansion countries, including Japan, South Korea, and Taiwan, there is little NGO capacity (or at least NGOs that major marine funders have collaborated with in the past). WWF has one program officer focused on fisheries in Japan, and the MSC recently opened a three-person office there as well. Greenpeace has also been active on whaling and marine mammal issues in the region, but that is unlikely to enhance its ability to work on fishery management policy. A scoping effort is needed in order to evaluate the policy landscape and the opportunities that exist for greater NGO engagement on fishery issues.

CHAPTER 3: A GLOBAL AGENDA FOR SUSTAINABLE FISHERIES

Focus Area 2

Middle income countries and RFMOs: Encouraging management for major fisheries using MSY as a limit

Objectives

The health of one-third of global fisheries rests in middle income countries and RFMOs. The trajectory for fishery management in these countries is not at all clear, with relatively little attention paid to fisheries policy and management in these regions. Many large stocks are overfished, and most of the smaller coastal stocks and vulnerable species are in poor shape.

In the next five years, we expect to see a more concerted effort by the conservation community to promote better fishery management in the world's largest industrialized fisheries outside of the developed world, with particular attention to major fisheries in South America and on the high seas. The emphasis is likely to be on promoting HCRs and science-based TACs in large, single-stock fisheries (e.g., pelagic and demersal fisheries) in middle income countries or RFMOs. These should be supplemented by the use of catch shares to support TAC compliance wherever possible.[99] In addition, there should be a complementary focus on protecting threatened and endangered wildlife (particularly seabirds and turtles) jeopardized by these fisheries. Given the limited NGO policy advocacy capacity in most of these regions, the seafood market will have a powerful role to play in catalyzing change.

Concentration of Effort

A short list of middle income countries and management bodies (i.e., RFMOs) comprises over a third of international landings. Middle income countries and RFMOs represent some of the largest fishing nations in the world: the RFMOs (~10 MMT); Peru (7.3 MMT, #2 in landings), Chile (3.5 MMT, #6), and Argentina (1.0 MMT, #20) in South America; Russia (2.9 MMT, #8); Mexico (1.5 MMT, #15); and South Africa (0.6 MMT, #24) and Namibia (0.4 MMT, #34) in Africa. [Figure 3-12] In the next decade, improving fisheries management is likely to be a bigger priority in many of these countries. Rather than expecting sweeping national-level policy reform in each industrializing country, we anticipate that reforms may be concentrated on a fishery by fishery basis. Potential priority fisheries include:

- **Global tuna fisheries (6.3 MMT):** The conservation community may need a decade-long effort to aggressively promote the use of HCRs among RFMOs. This effort will require an integrated policy and market campaign, and it will take years to build and implement. In terms of particular species, skipjack tuna is among the world's most important fisheries (2.4 MMT globally). Though currently healthy, observers lack faith in the RFMOs' ability to limit the current escalation of effort to appropriate levels. Additionally, about half of skipjack is caught in sets on fish aggregating devices, which also catch a significant amount of juvenile yellowfin and bigeye tuna. RFMOs' inability to curb pressure on skipjack can potentially lead to inadvertent depletion of yellowfin and bigeye stocks. Pelagic longline and gillnet tuna fisheries are also a critical source of mortality for vulnerable shark, seabird, and turtle populations, and efforts should focus on the adoption and enforcement of bycatch reduction measures. Industry is a critical partner in the effort to improve global tuna fisheries. The tuna canning industry recently formed the International Seafood Sustainability Foundation (ISSF), which has established a global tuna improvement plan and begun discussions on the application of a rights-based management system in a tuna fishery, which would be an ideal outcome, but may first require the adoption of more general longer-term management plans to which RFMOs are held accountable.

[99] Recent analysis of catch chares shows that fisheries under catch shares show less catch variability around TAC. Melnychuk, M.C., et al. 2011. Can catch share fisheries better track management targets? Fish and Fisheries. DOI: 10.1111/j.1467–2979.2011.00429.x

Figure 3-12

Major middle income fishing countries

	Importance		
Area	**2008 landings**	**% of global landings**	**Stock health**
RFMOs	~10M	13%	Mixed performance
Peru	7.3M	9.6%	ITQs for industrial stocks; coastal fishery problems, approaching MSY
Chile	3.5M	4.6%	Institutionalized TACs set too high (politics); problematic management of anchoveta. TURF used for abalone
Russia	2.9M	3.9%	Relatively healthy; IUU in crab and salmon
Mexico	1.5M	2.0%	TAC system for some species; overfishing of vulnerable populations, weak enforcement capacity in most areas
Argentina	1.0M	1.3%	TACs for hake, squid; in MSC assessment
South Africa	0.6M	0.8%	Strong management of industrial stocks, ITQs
Namibia	0.4M	0.5%	Strong management, ITQs, no artisanal sector

Source: FAO FISHSTAT marine landings, 2008

Focus Area 2 – Middle income countries and RFMOs (continued)

- **Anchoveta in Peru and Chile (6.5 MMT and 1.1 MMT respectively):** As the world's largest collection of fisheries, anchoveta in South America should be a major priority. An ITQ is already in place for Peruvian anchoveta, but a stronger HCR system could be implemented. Chilean management is more problematic and should be improved. In addition to anchoveta, jack mackerel, and herring in Chile are large, high priority fisheries (0.9 and 0.8 MMT).
- **Pollock, cod, and salmon in Russia (1.3 MMT, 0.27 MMT, and 0.26 MMT):** After Peruvian anchoveta, the Russian pollock fishery is the largest single-species fishery in the world. The Alaskan counterpart to this fishery is well managed through a quasi-ITQ cooperative system, and Russia has a history of strong, centralized fishery management. However, IUU and a lack of transparency plague many Russian fisheries, including pollock and salmon. FIPs are already underway, using market pressure to improve the management of both fisheries and prevent future overfishing.
- **Argentinean hake (0.25 MMT):** An ITQ process is underway for the hake fishery, which is one of the most important whitefish fisheries in South America and is in need of rebuilding. Argentina has reasonable fishery management capacity, and the initial effort on hake could be expanded to include a better HCR for squid and hoki (0.25 and 0.1 MMT).
- **Mexican sardines and shrimp (0.40 MMT and 0.05 MMT):** Mexico has half-embraced a transition to catch shares and is currently experimenting with the use of ITQs for shrimp fisheries in the Gulf of California. While a difficult fishery to address, this work should be continued in the hope that Mexico will move toward a wholesale adoption of various rights-based management tools.
- **South Africa and Namibia:** Both countries already have ITQ systems in place for major fisheries. In South Africa, the hake fishery is MSC-certified and relatively strong already; domestic NGOs should consider focusing on the management of small pelagic fisheries (anchovy, pilchard). Namibian fisheries also use ITQs, but their management systems are less robust than those of their neighbors to the south. Improving HCRs in the industrial horse mackerel and hake fisheries is a logical focus (0.19 MMT and 0.13 MMT).

Collectively, these fisheries represent a quarter of global landings.

Figure 3-13

Efforts to reduce bycatch

Reduction measure	Examples
Bycatch TAC	• CCAMLR establishes TACs for bycatch species and ties them to TACs for target species. When bycatch TACs are reached, areas are closed to fishing even if the target species TAC has not been reached
Seasonal/area restrictions	• SEAFO imposed bottom trawling closures on seamounts and has implemented studies of the closed area resources and experimental fisheries in the area to assess and mitigate potential impacts • WCPFC, IATTC and ICCAT have time/area closures in purse seine fishery
Minimum size/ corresponding mesh/ hook size requirements	• CCAMLR has mesh size regulations • ICCAT is the only RFMO with minimum size requirements for Swordfish and Bluefin tuna in order to minimize bycatch of small fish
Innovative methods to reduce entanglement	• CCAMLR has rules for streamer lines, offal controls, line weights, and night settings • CCSBT requires streamlines in certain areas (where seabird concentration is highest)
Safe handling technique training	• IATTC has an instructional video for turtle handling • WCPFC directs purse seiners to stop net roll to disentangle turtles • IOTC has developed guidelines for safe handling and release
Measures to regulate recreational and charter boat fisheries	• GFCM collecting data on relevant exploratory information on recreational and sport fisheries

Note: Refer to RFMO Appendix for measures that have been rejected

Focus Area 2 – Middle income countries and RFMOs (continued)

Theory of Change

The environmental community has traditionally had little influence on fishery policy throughout most of this region. Improvements in fisheries policy are likely to require greater engagement by seafood markets, using buying power to stimulate the reform process. The FIP work of organizations like SFP, WWF, and ISSF is proving to be a powerful tool, with certification as an eventual carrot. In addition to general market pressure, the reform effort would benefit if there was a stronger environmental presence in these countries dedicated to working on better fishery management policies and regulations.

Policy Advocacy

Each industrializing country and fishery will have its own idiosyncratic set of priorities. In the next five years, the overall emphasis is likely to be on promoting science-based TACs, enshrined in HCRs, and supported by performance-based management systems. As the environmental community has a relatively weak position in most industrializing fishing countries (e.g., Peru, Russia, Chile, Argentina, South Africa, and Namibia), the conservation community should seek to develop small, politically savvy in-country teams, focused on promoting better fishery management. Their work could be supported by capacity development efforts promoting detailed bio-economic modeling and policy recommendations, along the lines of the analyses highlighted in Chapter 2.

With respect to RFMOs, major reforms are needed. Plagued by highly politicized, consensus-based decision-making processes, it has been nearly impossible for RFMOs to fulfill their mandates. With the exception of CCAMLR, whose founding objective is to conserve the Antarctic's living marine resources,[100] RFMOs have defaulted toward short-term profit maximization. While some RFMOs (e.g., IATTC) have been relatively open with their decision-making processes, transparency, on the whole, has been limited, affording outsiders little insight into the decision-making dynamics.

Policy advocacy in the RFMO context should improve accountability, and push for the imposition of HCRs and LTMPs for the most threatened stocks. In terms of the former, an independent, objective database could be created that tracks RFMO progress against stock assessments and potential recovery trajectories for key stocks. Independent performance reviews of RFMOs, which were agreed upon in the 2006 UN General Assembly Resolution on Sustainable Fisheries, contain a wealth of information, but a database could improve the accessibility of data on RFMO performance.[101] This database might be similar to E.U. Transparency's fishsubsidy.org database, which also keeps track of infringements by vessels that use illegal fishing gear or misreport landings. In terms of the latter, HCRs urgently need to replace the current, highly politicized quota allocation, which is largely immune to the input of scientists and often woefully inadequate to maintain stock health. A set of well-designed HCRs and LTMPs, ideally as part of a catch share system, would address these political issues, but they, of course, would be subject to intense political pressure in and of themselves.

In addition to reducing overfishing, there needs to be greater reforms at the RFMO and country level to reduce fishing mortality of marine wildlife. In particular, reducing mortality of threatened seabirds (particularly albatross and petrels) ought to be a critical issue for RFMOs in the Southern hemisphere, and in coastal fisheries in Argentina, South Africa, Namibia, Chile, and Brazil. Reducing turtle and shark hooking is also a priority. [Figure 3-13] [See Appendix 3 – RFMO Review]

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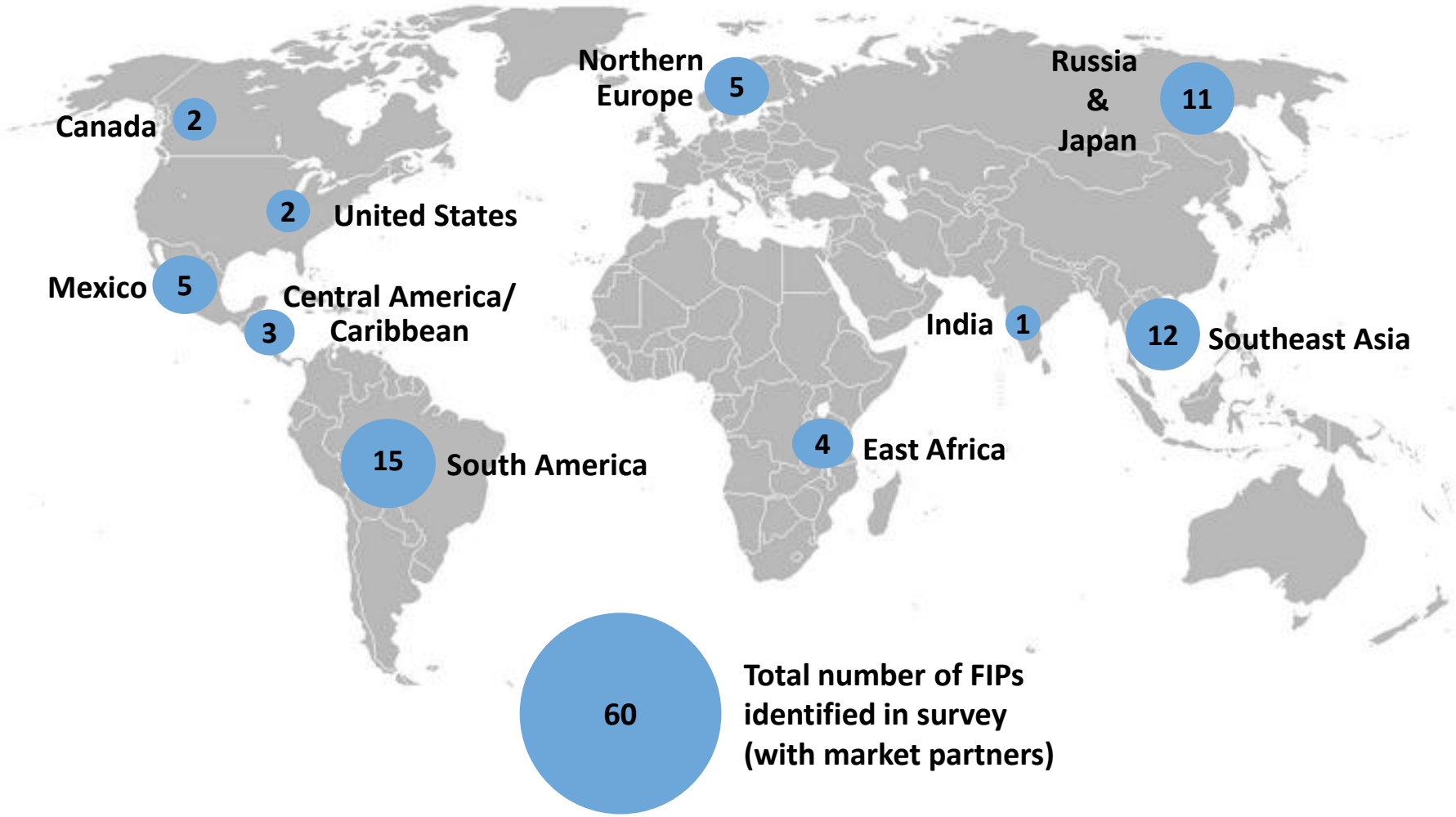
[100] Recent CCAMLR, Text of the Convention on the Conservation of Antarctic Marine Living Resources
[101] United Nations, 2006. Resolution adopted by the General Assembly 61/105.

Figure 3-14

FIPs are growing in popularity worldwide, and show promise as a new tool for increasing buyer engagement and pressure



Source: SFP and WWF data, 2011.

Focus Area 2 – Middle income countries and RFMOs (continued)

Despite the depletion of certain seabird, sea turtle, and shark species as a result of high bycatch rates in RFMO fisheries, most RFMOs only recently started to require basic data collection. CCSBT only required shark, turtle, and seabird data collection beginning in 2010, while ICCAT and IATTC established requirements for observer programs in their longline fisheries in 2010 and 2011, but have yet to implement this, or establish what data should be collected. Data, when available, is often of poor quality. Attempts to list threatened shark species have also been blocked by adversely affected parties. For example, in 2010 Canada opposed listing the porbeagle shark on CITES Appendix II. In 2009, Japan opposed measures proposed to ICCAT to protect shortfin mako sharks. These omissions demonstrate RFMO members' indifference to the very significant bycatch issues of their fisheries, which should be addressed through a variety of actions, ranging from public campaigns to legal strategies, such as CITES/IUCN listing and, most importantly, market campaigns (see below).

In addition to top-down policy advocacy at the RFMOs, the conservation community should look to push forward policies that promote conservation of highly migratory stocks within various EEZs. The United States, for example, has a long standing ban on the directed catch of bluefin tuna in the Gulf of Mexico. Promoting protective measures such as spawning ground closures, temporal closures, and gear restrictions within EEZs is an important complementary strategy to top-down RFMO reform.

Market Transformation

Fishery improvement projects promise to be a central component of the conservation community's efforts in the industrializing world. These projects use the buying power of seafood markets to promote reform in a few problematic but fixable fisheries. Typically, NGOs coordinate the purchasing power of groups of engaged buyers, effectively delivering an ultimatum to fisheries to improve or lose the market. FIPs then help the affected fisheries adopt the needed reforms. This approach has grown substantially over the last five years, with dozens of collaborative efforts in place around the globe [Figure 3-14]. These FIPs represent a promising step in the evolution of the seafood market transformation movement, effectively bridging market interest in sustainability with actual change on the water.

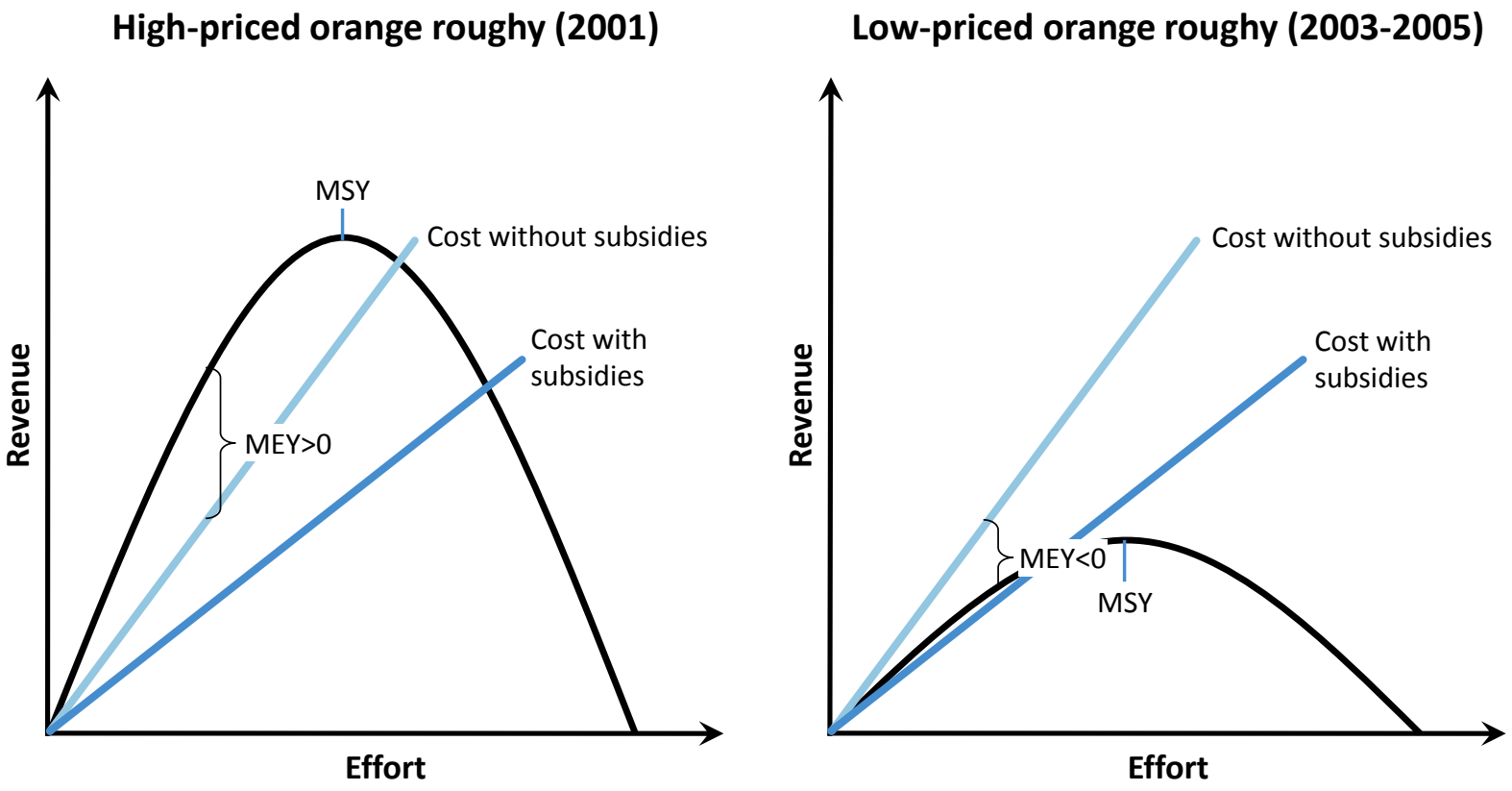
To date, FIP work has been concentrated in a handful of commodities, including whitefish, tuna, salmon, small pelagics, and shrimp. [See Appendix 5 – Commodities] The specific commodities selected are typically internationally traded, important to engaged buyers, in need of improvement, and have the management fundamentals in place to actually achieve success. In addition to the FIPs run by organizations like SFP and WWF, ISSF (in collaboration with WWF and leading scientists) has brought together the world's largest tuna canners to encourage better management in global tuna fisheries. Their market reform efforts are pressuring RFMOs to adopt more conservative TACs and bycatch mitigation measures.

Currently, the majority of global whitefish, small pelagics, and salmon production is either in the MSC program or in a FIP. Canned tuna is also effectively under a FIP through ISSF's efforts. Over the next five years, the FIP approach is likely to continue to grow, particularly in the priority countries, fisheries, and commodities outlined above. [Figure 3-11][See Appendix 5 – Commodities] Priorities for FIP-related efforts include:

- Stronger TAC-setting processes, rebuilding plans, and reduced IUU for whitefish, transitioning to a commodity-wide focus on greater habitat protections.

Figure 3-15

From 2003-2005, orange roughy prices dropped so much that fishing for the species would have been unprofitable if not for subsidies



Focus Area 2 – Middle income countries and RFMOs (continued)

- Using market clout to improve RFMO governance by adopting HCRs and science-based management measures. Also trying to promote the adoption of ITQs across multiple countries within a tuna RFMO, which would have the potential to break the annual allocation fights.
- Encouraging better management (e.g., HCRs, catch shares) and certification for small pelagic fisheries. The International Fishmeal and Fish Oil Organization (IFFO) may be able to expand the small pelagic work to include the "trash fisheries" of the developing world.
- Reducing bycatch and habitat effects of select warm-water shrimp fisheries, through better gear selection (bycatch reduction devices (BRDs), TEDs), closed areas, and reduced effort.

The FIP approach will become standardized over the next five years, as the number of FIPs plateaus – a point at which new FIPs will be balanced by fisheries exiting the program to enter certification. FIP projects should strive for congruence with the MSC in order to avoid the creation of rival systems. While the MSC doesn't currently have a defined FIP approach, it provides a set of clear principles and criteria suitable for FIP standardization, as well as a powerful pre-assessment tool, and a concrete target in the long term.

Over the next decade, one promising scenario would be for FIPs to transition away from NGO-led initiatives around single fisheries, toward industry and NGO jointly-led efforts covering entire fishery sectors, such as whitefish, tuna, and crab. ISSF is one example of this, and its work should be supported and watched closely as a possible model to replicate. In the small pelagic sector, IFFO is another promising body. IFFO membership includes many large buyers of fishmeal and fish oil (e.g., aquafeed manufacturers and aquaculture producers), and IFFO is already launching its own improvement program. Other potential sector-wide initiatives could include whitefish and shrimp, given the market interest in these commodities in the developed world and the presence of many large buyers.

Intergovernmental Pressure

Efforts to reduce subsidies and fight IUU are essential supporting initiatives. Particularly on the high seas, fuel and vessel subsidies help drive fishing pressure toward stocks that were not economically viable to exploit in the past. [Figure 3-15] Currently, the World Bank, WWF, and Pew are evaluating the impacts of subsidies on global fisheries and the potential gains from redirecting subsidies toward better fisheries management or R&D. The E.U. and North America have especially made steps toward shifting subsidies away from capacity enhancement. As of 2007, Europe prohibited vessel construction subsidies as part of an overall effort to reduce harmful subsidies under the CFP program. [See Appendix 8 – Subsidies Review]

IUU is also a huge obstacle in the enforcement of TACs and conservation measures on the high seas. Along with better observer coverage and reporting requirements within RFMOs, port state measures are an important tool to fight IUU. These measures are requirements for foreign fishing vessels and can include mandates such as the use of designated ports, restrictions on port entry and landing fish, documentation requirements, port inspections, IUU vessel listing, trade-related measures, and sanctions. The Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing was approved by the FAO in 2009 and contains many of these provisions. At least 15 countries and the E.U. have ratified the agreement, which needs 25 signatories to take effect. Pew and others are working to promote the provisional application of key conditions and their adoption by RFMOs. In addition to promoting the adoption of these measures, fishing vessels operating internationally should be required to have

Focus Area 2 – Middle income countries and RFMOs (continued)

unique International Maritime Organization numbers in order to prevent illegal operators from disguising their vessels, complemented by a mechanism to exchange data across states to better track illegal operators.

Given that RFMOs are difficult political environment in which to work, resolutions of the United Nations General Assembly provide another mechanism to help drive change. Resolutions are already in place to protect critical deep-sea habitats, to mandate environmental impact assessments, and to require sustainable fishing practices. These resolutions have led to concrete, albeit piecemeal, changes on the water including, Spain adopting bottom-trawling closures in the Southwest Atlantic, freezing the footprint of fisheries in the North and South Pacific, and banning bottom trawling in CCAMLR. More work is required to embed the principles of these international agreements in fisheries management practices on the high seas.

Finally, development agencies and multilaterals have a powerful role to play in promoting the reform of key fisheries in middle income countries. For example, in 2006, a World Bank report on Peru documented the tremendous overcapacity and loss of economic rents in the industrial anchoveta fishery. The World Bank had proposed ITQs in the fishery as early as 1992, which the fishery ultimately adopted. The World Bank, Inter-American Development Bank (IADB), Asian Development Bank (ADB), and other multilateral institutions should play a proactive role in encouraging the optimal management of these fisheries, even if only from an economic productivity perspective.

Existing Capacity

Despite their large share of global landings, the conservation community's engagement with industrializing country fisheries has been limited. On the policy side, the decision-making structures of RFMOs create a difficult environment for generating meaningful reforms. The challenge is similarly difficult in middle income countries, with each country having a unique set of priorities, decision-making structures, and acceptance of NGO involvement. Despite these challenges, the sheer size of these fisheries makes them important targets for reform, and the community's capacity should be built to work with these fisheries. To complement the policy work, the conservation community should continue to enable the strong and growing capacity of organizations trying to promote change in these fisheries through market transformations. [See Appendix 7 – Regional Fishery Summaries]

- RFMOs – Moderate: Several organizations are pushing for improving RFMO managed fisheries. Pew has a campaign to protect tuna globally and has been promoting the adoption of port state measures to reduce IUU on the high seas. WWF has worked on improving tuna fishery management through engagement with RFMOs, CFP engagement (bluefin tuna), and bycatch mitigation efforts in longline fisheries. Birdlife International has been active with all five tuna RFMOs on bycatch mitigation measures and tracking bycatch performance. Other NGOs involved in RFMOs include Oceana and Greenpeace. The capacity to drive market interventions for purse seine fisheries is reasonable given the growth of ISSF. In addition, MSC is working to certify the best available tuna fisheries (just two to date), and SFP and WWF have been working with several tuna fisheries in fishery improvement projects.
- Peru/Chile – Weak: A handful of local organizations have been engaged with the Peruvian anchoveta fishery, but there has been little foundation support or BINGO presence. Fundacion Cayetano Heredia developed an ecosystem model of the anchovy fishery to help inform fisheries management decisions, and oversaw the MSC pre-assessment of the fishery. WWF has also been engaged on reforming management of the fishery. This work has built off of the

Focus Area 2 – Middle income countries and RFMOs (continued)

World Bank's efforts that led to the development of an ITQ for the anchovy fishery. The Nature Conservancy is working in the Humboldt Current to promote marine reserves and sustainable fishing measures. Organizations focusing on market interventions are also active in Peru with the anchovy fishery undergoing MSC pre-assessment, and IFFO likely to exert its influence on the fishery through its new certification for the responsible supply for fish-meal and fish oil. In Chile, almost all of the NGO capacity (e.g., Oceana) has been directed toward protected areas, or aquaculture. Implementing a campaign to reform the industrial fisheries will require the development of policy capacity in the country. Similarly, market engagement in Chile has been limited, but may be an important expansion target given the large single-species fisheries in the country. BirdLife International is also active in the region with its Albatross Task Force working to implement bycatch mitigation regulations and demonstrating best practices.

- Russia – Weak: Foundations and NGOs have not invested substantially in Russia, apart from work on salmon. WWF has one national fisheries advisor in the country. In Eastern Russia, a handful of NGOs have focused on FIPs, including SFP, Wild Salmon Center, and WWF. Greenpeace has played a small role on fisheries in Western Russia. The limited capacity in the region is probably an appropriate level given the overall challenges for NGOs working in Russia, and the relative health of their fisheries.

- Argentina - Weak: Wildlife Conservation Society (WCS) works on a Patagonian and Southwest Atlantic seascape, and Fundacion Vida Silvestre is active in fisheries and marine conservation, but there appears to be limited additional policy capacity on the ground. BirdLife International is working on bycatch mitigation in the region. On the market side, SFP is engaged with several important fisheries in the region: Argentine hake, hoki, blue whiting, and Uruguyan/Argentine hake. The first two fisheries are already under MSC assessment, and the latter two are now in the early stages of a FIP. There is clearly an opportunity to build more capacity in Argentina, and the active participation of fisheries in FIPs and market certifications indicates that this may be a region that is ripe for more market and policy interventions.

- Mexico – Strong: Mexico has numerous NGOs active on fisheries and CBFM, especially in the Gulf of California. The majority of activity is directed toward protected area development and management through organizations such as TNC, Communidad y Biodiversidad, and Pronatura Noroeste. In addition to protected areas, there is a strong movement to develop catch shares in the region. EDF, WWF, Noroeste Sustentable, Rare, Defensa Ambiente al Noroeste, and others have been active in the catch share movement. Several organizations are also active on threatened marine wildlife issues, including NRDC, WWF, and Fondo Mexicano para la Conservacion de la Naturaleza. On the market side, SFP works with several fisheries, including two shrimp fisheries in the Gulf of California, a shrimp fishery in the Gulf of Mexico, and a swimming crab fishery. Several fisheries are currently under MSC assessment in the region, the largest being the sardine fishery in the Gulf of California.

- South Africa/Namibia – Moderate: There is limited NGO capacity in South Africa and Namibia. WWF has a South Africa office focused on effective management of existing MPAs and development of new MPAs. On the market side, MSC has a small office in the region and has certified the hake trawl fishery, but no other important fisheries are under assessment or in a FIP. The most significant organization in the region may be the UN's Global Environment Fund (GEF), which has a $64 million dollar project ($5.4 million from GEF) to restore depleted fisheries and reduce coastal resource degradation in the Benguela Current Large Marine Ecosystem. Longline and trawl fisheries in the region are some of the most dangerous for threatened seabirds, and BirdLife International's Albatross Task Force is working to implement bycatch regulations and demonstrate best practices on the water.

CHAPTER 3: A GLOBAL AGENDA FOR SUSTAINABLE FISHERIES

Focus Area 3

Commercial fisheries in the developing world: Initiating effective mortality control measures

Objectives

Even if fisheries in the developed world progress toward EBFM and industrializing nation fisheries and those on the high seas turn the corner, the overall situation in the developing world will continue to deteriorate. International seafood markets may help to stimulate improved management in high-volume, single-species export fisheries. But in the absence of greater governmental commitments to fishery management, the marine environment in most of Southeast Asia, Africa, and Central America will continue to decline over the next decade. Sustainable fisheries efforts in the developing world are fundamentally limited by the lack of effective fishery management capacity. These regions collectively represent nearly 40% of global landings, 95% of the fishermen, and some of the most damaged and poorly managed fisheries. NGOs and governments are resource-constrained, and the confounding problems of corruption and IUU are ever-present. The problem spreads across both the commercial fisheries (often pelagic and demersal trawl fisheries) and the small-scale, coastal fisheries. Weak institutional capacity makes top-down management difficult to implement, and CBFM is often the tool of choice. However, offshore and migratory fisheries are difficult to govern with CBFM approaches alone. As a result, two distinct but related efforts may be required: building government capacity to initiate basic mortality controls for industrial fisheries (addressed in this section), and promoting more community-based solutions in biodiversity hotspots (discussed in Focus Area 4).

Building management capacity in developing world governments is not a skill set at which the environmental community excels. The development agencies and multilaterals will continue their hard work in building natural resource management expertise. The conservation community can contribute by helping to make the case for greater governmental commitments to fishery management in economic and social development terms. The core objective of this focus area is to build the case for responsible fishery management based on economic and social development returns, such that a handful of critical developing countries opt to invest in improving management systems. Due to the high turnover rate of government members in many regions, the selection of the right capacity building targets within government institutions will be crucial to ensure enduring change.

Concentration of Effort

- **China:** China has the greatest potential for improved fishery management. It is the largest fishing country in the world (9.8 MMT, of which 7.1M MMT is from fisheries within its EEZ), yet China's domestic fisheries are essentially unmanaged and are believed to be heavily overfished. There is a reasonably good fishery policy in place on paper (featuring both input and output controls), and there is already a government commitment to reducing overcapacity.[102] In practice, however, fishery management is limited to the establishment of a nationwide three-month closed season during the summer, vessel licensing, and a trawling ban in the Bohai Sea. Moreover, enforcement is entirely lacking, and the science and data collection efforts are bedeviled by reporting issues. China's seafood focus has included the growth of aquaculture and its distant water fleet. The country has the potential to do much better if domestic fishery management were also elevated as a national priority.

[102] The 11th 5-year Guidelines for Fishery Development imposes a "zero growth" policy on domestic fisheries. The Bureau of Fisheries also has a National Fishery Technical Extension Center with 13,000-plus stations (they presumably focus on aquaculture), as well as fishery enhancement programs in the Yellow and Bohai Sea.

Figure 3-16

Major developing world fishing countries

Area	Importance			
	2008 landings (Tonnes and % of global landings)	Stock health	Biodiversity hotspot	Food security
China	9.8M (13%)	Decent fishery laws, but no effective management		
Indonesia	4.5M (6.0%)	Weak management, Malthusian overfishing	Coral Triangle	Yes
India	3.1M (4.1%)	Zero data		Yes
Philippines	2.4M (3.1%)	Systemic overfishing	Coral Triangle	Yes
Thailand	2.2M (2.9%)	Zero data – presumed ecosystem overfishing		Yes
Viet Nam	1.9M (2.5%)	Zero data – annecdotal ecosystem overfishing		Yes
Myanmar	1.7M (2.2%)	Zero data		Yes
Malaysia	1.4M (1.8%)	Better than Indonesia or the Philippines, but still overfishing	Coral Triangle	
Bangladesh	0.3M (0.4%)	Zero data		Yes
Papua New Guinea	0.2M (0.3%)	No data – presumed poor	Coral Triangle	Yes

Source: FAO FISHSTAT marine landings, 2008, China landings adjusted with SAUP data

Focus Area 3 – Commercial fisheries in the developing world (continued)

- **Southeast Asia and India:** Capacity development is needed throughout much of the developing world, but with a particular focus on Southeast Asia. Critical countries include Indonesia (4.5 MMT in landings, and weak management), India (3.1 MMT and no information on the state of management), the Philippines (2.4 MMT, weak management, and nearly one million fishermen), Thailand (2.2 MMT), and Vietnam (1.9 MMT). [Figure 3-16]

Theory of Change

Recognizing the limitations of environmental advocacy efforts in the developing world, the main thrust of this campaign is capacity-building assistance. These capacity-building efforts may be bolstered with supporting market campaigns. However, governments move slowly, and the conservation community needs to enter into this work with a longer-term investment timeframe: this is at least a decade-long initiative.

Policy Advocacy

Policy advocacy efforts in the developing world have a distinctly different flavor than in the developed world. Convincing reluctant governments of the merits of strong fishery management requires a compelling demonstration that this is in their own economic, social, and environmental self-interest. Making that case requires country-specific, politically relevant bio-economic analysis and regulatory design services to support a nation's fishery management as it charts a course toward economic prosperity.

- **China outreach:** There is currently no strong NGO, foundation, or market effort focused on Chinese fisheries management. A China-specific initiative would have to rely on a partnership with Chinese institutions based on the theme of fishery productivity, rather than environmental conservation. The first joint step could be a thorough assessment of current fishery performance across China's vast EEZ. Then, in cooperation with the Department of Agriculture, a jointly developed training program may be designed and implemented for the federal fishery department in Beijing (60 people) and the district fishery department heads. A modest technology transfer program may be needed to provide the infrastructure required to impose HCRs on the commercial fisheries. Supporting ITQs in China may be a natural fit, given the existing goals around reducing capacity. The Japanese anchovy fishery in China (0.65 MMT) could be a logical starting point for a reform effort. It is an offshore fishery with an industrial fleet, it is important for both local food supply and the aquaculture industry, and it would have the benefit of short recovery times and relatively easy management. The fishery is already involved with IFFO and may be a natural fit for their new Improvement Program. The recent expansion of international private equity funds like the Carlyle Group into Chinese fisheries may be another promising angle for applying market pressure.
- **Additional technical assistance:** As mentioned above, the developing world is the premier clientele for any organization that can provide fishery-specific green growth plans. It is essential that this work be conducted at the invitation of its client countries. Typically, technical advisory services should be free, predicated only on the invited country's demonstrated commitment to installing sustainable fishery management techniques.

Focus Area 3 – Commercial fisheries in the developing world (continued)

Market Transformation

Using the market to drive change in developing countries will be a slow but important effort. The large majority of fisheries are basically uncertifiable (e.g., MSC has only certified one fishery in Southeast Asia), and hence FIPs will need to serve as the entry point in commercial fisheries in these regions. FIPs only work if there is sufficient institutional capacity to manage the fishery. As such, current efforts are focused on a handful of the most manageable commodities: such as resilient small pelagic fisheries, internationally influenced tuna fisheries, and local blue crab fisheries. [Figure 3-17] This FIP work will be used to raise the salience of these issues among the fishery management institutions and other government bodies. The recently formed Allfish, which is a partnership between the seafood industry, the International Coalition of Fisheries Associations, the World Bank, FAO, and GEF, is another entity that is using market incentives to promote improved fisheries management in developing countries.

Intergovernmental Pressure

Development agencies and other multilateral institutions already play an enormous role in building fishery management capacity in the developing world (USAID, JICA, DFID, GIZ, GEF, World Bank). A number of foreign aid bodies already operate in Southeast Asia. USAID has a large presence in Indonesia and the Philippines and funds fisheries projects. The Japanese are heavily engaged in the region via JICA. Australia is also involved in a limited way via Ausaid and, more substantially, via the Australian Centre for International Agricultural Research (ACIAR). Several European aid bodies have been engaged in countries like Vietnam (Norwegian Agency for Development Cooperation (NORAD) and Danish International Development Assistance (DANIDA), and Swedish International Development Cooperation Agency (SIDA) has been active in helping fund Southeast Asian Fisheries Development Center (SEAFDEC), but European aid bodies appear to be slowly pulling out of the region in favor of Africa. Other multilateral investments include ProFish's analysis and the World Bank's subsequent investments in Vietnam and India, and JICA's work to enhance marine and fisheries administration in Indonesia. The lion's share of future resources to build fishery management capacity will continue to come from these institutions.

Strengthening Management Capacity in Southeast Asia: Currently, there is much room to strengthen the FAO's and other multilaterals' roles in capacity building for fishery management in Southeast Asia. In terms of current multilateral efforts;

1. The Coral Triangle Initiative (CTI) is deeply involved in the region, and includes national governments, NGOs, and development agencies. However, fisheries are only one out of five themes in CTI. The CTI was primarily created as a biodiversity project and is not effectively building the basics of fishery management capacity across the whole region.

2. The Asia Pacific Fisheries Commission (APFIC) is the FAO's oldest fisheries commission. It has no staff and is serviced by the FAO in Bangkok. APFIC has an annual meeting of interested parties and ministers. It puts issues on the agenda of governments, provides some valuable information, and tries to get resolutions from fisheries agencies to make progress. However, it lacks the resources to proactively drive change in the region.

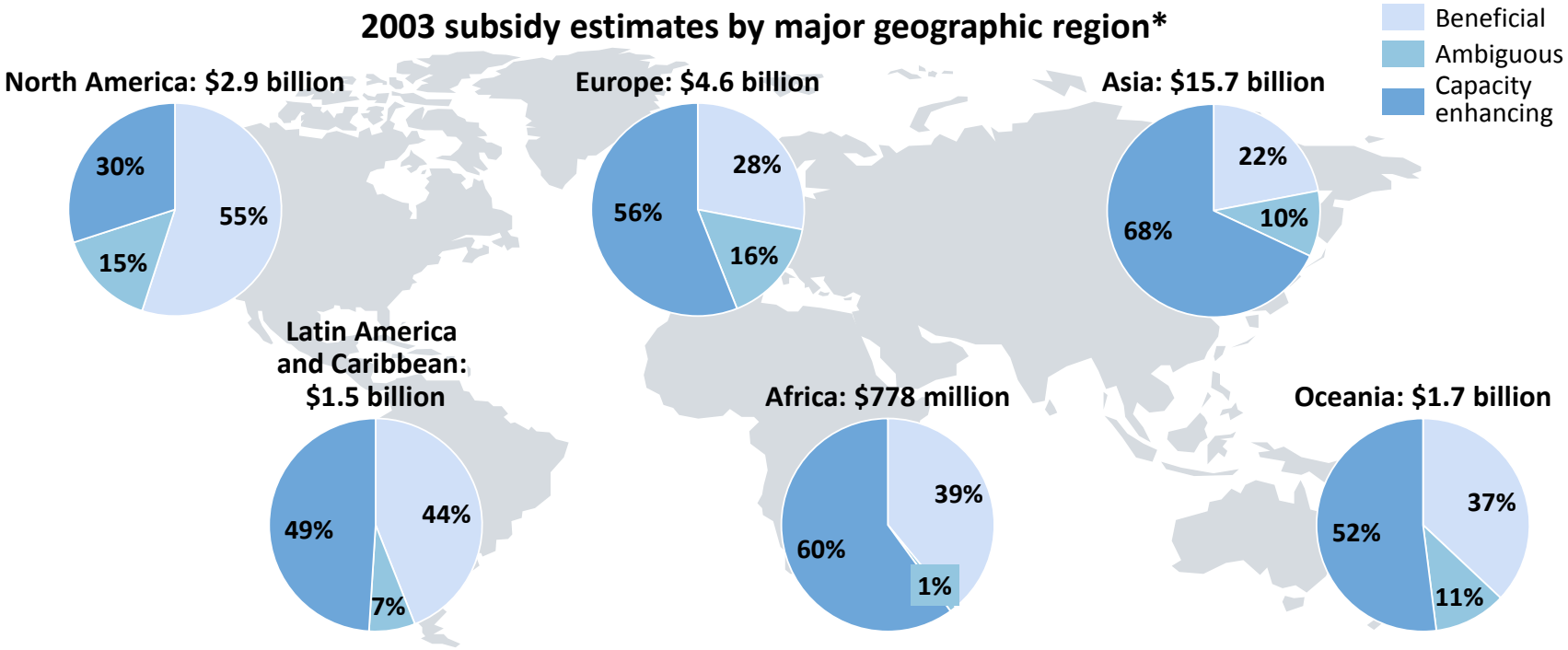
3. SEAFDEC headquartered in Bangkok, is an intergovernmental body that conducts research and fisheries development projects in collaboration with the ASEAN Secretariat, and is supported in part by the Japanese government. SEAFDEC is very focused on industry and government, and convenes plenty of meetings and workshops to gather and disseminate information, but progress remains slow.

Figure 3-17
Selection of SFP FIPs in the developing world

Fishery	Location	Date launched	FIP stage	Size Tonnes
Gulf of California industrial shrimp	Mexico	2010	1	40,000
Gulf of California Sonora artisanal shrimp	Mexico	2010	1	7,000
Gulf of California blue swimming crab	Mexico	2008	3	
Indonesia blue swimming crab	Indonesia	2007	3	
Indonesia wild shrimp	Indonesia	2010	1	
Indonesian snapper	Indonesia	2009	1	
Indonesia yellowfin tuna	Indonesia	2010	1	
Philippine blue swimming crab	Philippines	2010	3	33,794
Sri Lanka tuna	Sri Lanka	2009	2	

Figure 3-18

Asia spends about $11 billion per year on capacity enhancing or more ambiguous subsidies



Beneficial

Subsidies that support healthy fish populations

- Fisheries management
- R&D
- MPAs

Capacity enhancing

Subsidies that enhance fishing capacity and contribute to overfishing

- Boat construction, renovation
- Fisheries development project
- Fishing access
- Fishing port development
- Fuel subsidies
- Marketing and storage infrastructure
- Tax exemption

Ambiguous

- Fisherman assistance
- Rural fishing community development
- Vessel buyback programs

* Europe banned vessel construction subsidies in 2007 and the proportion spent on capacity enhancing subsidies has declined significantly since this study was conducted
Source:Sumaila, U.R.et al., 2010. Subsidizing Global Fisheries: A Summary of a New Scientific Analysis." The Pew Environment Group Ocean Science Series.

None of the bodies are effectively building the fundamentals of fishery management. As one regional expert summarized:

"There is a vacant niche—actually a yawning, cavernous hole—for a fisheries focused initiative. Most of the arrangements currently in place (except CTI) are solely or largely government-based. An initiative that spans the region is needed to take into account the current levels of integration in terms of trade flows and fleet mobility. Cracking down (i.e., making improvements) in one area simply distorts the current arrangements by transferring fishing effort (generally illegally) to other areas and new trading arrangements get set up very rapidly."

At a minimum, governments need to provide greater resources to APFIC and SEAFDEC, and strengthen the role of CTI in delivering fishery management fundamentals.

Subsidy, fishery access agreements (FAAs), and IUU efforts: In addition to the capacity building efforts, reducing "bad" subsidies is critical for the developing world. Fuel and vessel construction subsidies, while not the primary culprit of overfishing, continue to drive the exploitation of economically marginal stocks in open access fisheries (e.g., deepwater species and low-value species). Asia is the largest source of bad subsidies, by a wide margin. [Figure 3-18] There is a need to fight harmful fishing subsidies internationally. The opportunity to do so is ripe in the current environment of fiscal deficits and already under discussion through the Doha round, through the OECD, and at the national level. [See Appendix 8 – Subsidies Review] Similarly, FAAs have been criticized for transferring excess capacity to the developing world. However, there are multiple pathways for that capacity to be transferred (e.g., flags of convenience, host companies, and IUU), and well-designed FAAs can provide a vehicle to promote better fishery management, particularly in Africa. Helping governments understand and structure supportive FAAs is an important area of engagement. In the Western Pacific, the Fisheries Forum Agency and the Parties to the Nauru Agreement (PNA) may be good models of cooperation between developing countries banding together in an RFMO context to strengthen their negotiating power, and potentially work towards more sustainable exploitation of fishery resources.

Focus Area 3 – Commercial fisheries in the developing world (continued)

Existing Capacity

The conservation community's capacity in the developing world is weak outside of the Coral Triangle; the capacity that is there is heavily focused on protected area management and development, rather than on fishery policy engagement. Building NGO capacity in the region should be done in a way to complement the multilateral and government projects that already exist in Southeast Asia. [See Appendix 7 – Regional Fishery Summaries]

- China – Weak: There is essentially no NGO capacity in China for marine issues. WWF has one program officer in the country focused on fisheries, and no other international NGOs have fisheries policy staff in the country. Rare has a wetland protection initiative in China, and TRAFFIC and Pacific Environment have worked on species trade issues. On the market side, International Institute for Sustainable Development (IISD) is engaging with the Chinese government on seafood supply chains, while MSC and SFP have done some chain of custody work in China due to its importance as a processing hub, and Wildaid and CI have focused on shark finning. Otherwise, NGOs have yet to work on fisheries in Chinese waters or work to educate consumer markets.

- Indonesia/Papua New Guinea – Moderate: Indonesia receives a large share of funding for marine conservation and numerous organizations are active in the region. The vast majority of effort is focused on protected areas and CBFM. WWF, TNC, and Conservation International (CI) are involved with the CTI. TNC, Rare, WCS, Wildaid, and WWF (among others) work on the ground to promote protected areas and community-based fishery management. On the market side, SFP is working with yellowfin tuna, sardine, shrimp, snapper, and blue crab fisheries. Continued FIP engagement will be an important driver of reform for the large fisheries in the region. Multilateral agencies are active in the region with ADB, GEF, USAID, and JICA all working on projects in Indonesia. The World Bank is also active in the region through its COREMAP project which aims to protect, rehabilitate, and ensure sustainable use of coral reefs to enhance the welfare of coastal communities.

- The Philippines, Thailand, and Vietnam – Weak: NGO capacity in the region is limited and focused on protected areas, but multilateral agencies have a strong presence in the region. WWF is active with the Sulu-Sulawesi marine reserve, tuna fisheries, and live reef fish trade. Rare has a major initiative to promote protected areas in the region. Greenpeace also has a Southeast Asia program that works in Thailand and the Philippines. Aid agencies have several important projects in the region. The World Bank is working on a major project in Vietnam, and USAID has a large project in the Philippines to develop fisheries management capacity at the local and national level. On the market side, engagement is very weak. SFP has the Philippine blue crab fishery as a client, and MSC has certified the Vietnamese Ben Tre clam fishery, but has no other fisheries in the program.

- India – Weak: There is essentially no international NGO engagement on fisheries in India. WWF is one of the few NGOs that works in India; it strives to protect mangroves, improve fisheries, and safeguard sea turtles. Multilateral aid agencies have some projects in India, including GEF's work on marine biodiversity protection on the Malvan Coast and the World Bank's recently approved project for coastal zone management.

CHAPTER 3: A GLOBAL AGENDA FOR SUSTAINABLE FISHERIES

Focus Area 4

Coastal fisheries in high biodiversity areas: Find community-based solutions for the massive pressure on coastal fisheries (CBFM)

Objectives

Many countries in Asia, Africa, and the Americas lack the fishery management institutions necessary to prevent overfishing. Managing large industrial fisheries in these regions is difficult; managing the multitude of small-scale, coastal fisheries in these regions is next to impossible. Over the last few years, there has been a convergence of thinking within the marine conservation community that combining community-scaled protected areas (i.e., no-take zones) with limited access regimes that allow those communities to benefit from the protections (i.e., TURFs) is the most promising solution to coastal fisheries depletion in the developing world. These systems, often called TURF-reserve systems, can run the gamut from community-controlled areas to individually tradable quasi-property rights. TURF-reserves have the benefits of not requiring detailed scientific input and only minimal external enforcement. They have the ecological benefit of creating habitat protections, even if they are for fishery replenishment purposes. And, ideally, they can be used to create lasting protections for coastal fisheries where other systems fail. There are only a handful of relevant examples from across the world of fully-fledged TURF-reserves. How to properly design and expedite the growth of these systems remains an open question and one with immense implications for the future of conservation efforts in these regions.

In the next decade, the conservation community will work to effectively test and potentially scale CBFM across the world's marine biodiversity hotspots.

Concentration of Effort

TURF-reserves could be applied in any coastal area of the world. However, the reality is that there are massive resource constraints to working at the community level. In thinking of this as a global problem, TURF-reserves are most needed in high-biodiversity, low-capacity regions. Logical countries to investigate the expansion of TURF-reserves would include Indonesia, the Philippines, Papua New Guinea and Malaysia in South Asia; the islands of the Western Pacific; Mexico, Belize, and the Caribbean Islands; and Kenya, Tanzania, and Madagascar in Africa. In Mexico, efforts to create fishery refuge zones have considerable momentum. Indonesia and the Philippines are two other logical countries to concentrate on, given the existence of numerous protected areas, their biological importance, and the combination of ongoing development aid funding and a decentralized fishery management system. Within those regions, we recommend the following guidelines:

- TURF-reserves require a national policy framework that permits communities to own and allocate use rights for fisheries. In target countries, reviewing and refining the relevant national laws needs to be a first step. Although Chilean TURFs have not yet been paired with no-take reserves, their system, which mandates that local communities develop their own allocation and management plans as a prerequisite for market entry or government funding, may be an ideal example for governments to follow.
- TURF-reserves will be most effective when there is a relatively homogenous community and low population densities. We have no reason to believe we can succeed at establishing these systems in highly populated areas that lack traditional use right systems.
- Local leadership, social capital, and institutional capacity are critical for the success of community-based fisheries management solutions, thus cross-cutting efforts to cultivate leadership and build capacity may be a necessary precursor to implementing TURF-reserves.

Focus Area 4 – Coastal fisheries in high biodiversity areas (continued)

- TURFs and related systems work best when scaled to the biology of the resource. To date, they have been effectively used for relatively low-mobility species (sea urchins, lobsters, and abalone). To be effective for more mobile species (shrimp, finfish), the size of the management units needs to be scaled substantially, which can probably only happen in low-population areas.

Theory of Change

The majority of the work associated with TURF-reserves will likely be most successful if they revolve around creating effective models at the local community level. These initiatives will need to be supplemented with support from multilaterals and bolstered through new models for market support.

Policy Advocacy

TURF-reserve systems require a national policy context to work properly. Most importantly, local marine tenure rights have to be legal—there cannot be a national law guaranteeing open access. In addition, two levels of fully integrated policy mechanisms have to work: First, the TURF-reserve systems have to be recognized by, and coordinated with, the national and provincial spatial planning efforts. In Indonesia, for example, a "Russian doll" system is in place in which basic land-use categories are established for terrestrial and ocean environments at a variety of scales, from local to national. This makes coordination an enormous challenge. Second, spatial and fishery management regulations have to be at least somewhat synchronized. For example, it is very difficult for local communities to keep out highly profitable live grouper or shark finning operations, unless there is a strong legal penalty in place.

This requires a seamless NGO presence from the national to the local level. For example, in Indonesia, there is now an NGO coalition under development that is anchored by the Birdhead's seascape project. These are complex and long-term efforts requiring considerable donor patience.

At the local level, it is essential to build, support, design, and promote CBFM/TURF-reserve systems. Systems must be reflective of the local social and economic context in order to gain broad acceptance throughout the community and to achieve ecological, economic, and social objectives. If properly designed, these systems quickly produce results in terms of increased yields, and community support is typically strong. However, this can crumble quickly if strong local leadership and institutional capacity is not in place, or if lacking provincial controls allow outsiders to rob the communities of the benefits of sustainable management. Given the importance of strong leadership, crosscutting efforts to cultivate leadership are likely to be explored. Several large conservation organizations, including Rare, CI, TNC, WCS, and WWF, are already involved in these efforts to promote leadership through training programs, infrastructural assistance, capacity building, etc.

The success of CBFM systems is ultimately dependent on a wide array of factors such as poverty, alternative livelihoods, social structure, and local leadership – factors which can be very difficult to influence. Researchers are actively working to develop a better understanding of the conditions for successful CBFM. Although there is great interest in TURF-reserve systems, the conservation community should not focus solely on any one cure-all form of fisheries management. Other solutions, such as basic gear restrictions, are also important and have proven effective and easier to design and enforce in many developing world fisheries.

Focus Area 4 – Coastal fisheries in high biodiversity areas (continued)

Market Transformation

The sustainable seafood market transformation initiative has only a tenuous connection to the development of TURF-reserves and CBFM at present. Problematic, small-scale, data-deficient fisheries in the developing world are uncertifiable. The MSC has certified only one relevant fishery: the Ben Tre hand-gathered clam fishery in Vietnam. Most of the products from these fisheries are sold locally or regionally, and there is very limited consolidation within the supply chain to drive change. Moreover, the scale of production (individual communities) is too small for most corporate initiatives to engage on.

As an initial foray, there are a handful of FIPs involving blue crab in the Philippines, Mexico, and Indonesia. Blue crab, for example, represents a logical commodity to start with given the relative resilience of the resource, its ability to be managed at a community scale, and interested U.S. importers. These FIPs may provide a beachhead for further market engagement in these regions if they result in improved market access for the fisheries. The market may be able to better facilitate the establishment of TURF systems, if national laws are modified so as to give processors or buyers functionally exclusive access rights to certain areas.

Intergovernmental Pressure

Funding these activities, especially at scale, will quickly exceed the capacity of the conservation community. Multilateral funders play an essential role, and require matched funding at different levels. Funding will thus have to be syndicated from several sources. We believe that the UN will be critical in this endeavor, either through the United Nations Environment Programme (UNEP), the Convention on Biological Diversity (CBD), or both. As noted in the previous focus area section, development agencies and other multilateral institutions already play a major role in building fishery management capacity in the developing world, and there is strong interest in both Southeast Asia and Africa. For example, USAID's Indonesia Marine and Climate Support (IMACS) project is a four-year effort to improve marine resources management in Indonesia, including the management capacity of the Ministry of Marine Affairs and Fisheries (MMAF) and local government. IMACS intends to "enhance local communities and the private sector engagement through open and transparent governance, and provide technical support for key activities that support marine resources management and communities' empowerment."[103] USAID has similarly had a long engagement in the Philippines. The World Bank has major initiatives underway in several regions, including a multiyear project to improve fisheries management in West Africa, Profish analytical work in Vietnam, and a project to improve marine management in Kenya. These projects are enormous in scale, often tens of millions of dollars, and will be a crucial component of promoting improved small-scale fisheries management.

Existing Capacity

[See Appendix 7 – Regional Fishery Summaries]

- Pacific Islands – Moderate: There is a reasonable level of capacity for marine conservation in the Pacific Islands, with current work primarily focused on protected areas and locally managed marine areas. NGOs including WWF, CI,

[103] http://indonesia.usaid.gov/en/USAID/Activity/271/Indonesia_Marine_and_Climate_Support_IMACS_Project

Focus Area 4 – Coastal fisheries in high biodiversity areas (continued)

WCS, Rare, TNC, SeaWeb, and others have been active in MPAs and locally managed marine areas across the Pacific Islands. Greenpeace has done work on distant water fishing. JICA is active in the region with a large project to enhance coral reef monitoring, and a smaller project to enhance fisheries management in Samoa. On the market side, a major tuna fishery recently achieved MSC certification, but there are no other fisheries in the program or in a FIP.

- Caribbean, Central America, and ETP – Weak: Several organizations operate in the Caribbean and Latin America, but this work typically involves small projects. Conservation International has a major effort in the Eastern Tropical Pacific seascape, which includes both protected area and fishery work. Rare and Wildaid also work in the ETP seascape. EDF and WCS are collaborating on catch shares in Belize. Greenpeace, Rare, WWF, TNC, CI and others are active in the Caribbean and Central America as well, but like in other developing parts of the world, the work is concentrated on protected and locally managed marine areas. JICA has been active in the Caribbean constructing infrastructure for the coastal, small-scale fishing industry. GEF has also worked on marine biodiversity protection in Panama, Costa Rica, Cuba, and Ecuador.

- Africa – Weak: For policy and fisheries management activities, multilateral agencies are the main actors in Africa. DFID, GEF, and World Bank are all engaged in fisheries management projects in West Africa. IFAD is another important multilateral agency working on improving the livelihoods of small-scale fisheries in several developing countries. JICA also invests in West Africa, but primarily for fishing industry infrastructure development. The World Bank is also active in Mozambique and Kenya with projects to improve fisheries management. Investment amounts are typically large. For example, the World Bank's project to improve the capacity of West African nations to manage target fisheries and increase the local value added to fish products was signed off with a budget of $45 million. Several NGOs are active in Africa. WWF, WCS, and the Blue Ventures Coalition help develop and manage protected areas in Madagascar and East Africa. WWF and WCS are also working on protected areas in West Africa along with Fondation Internationale du Banc d'Arguin.

Please see previous capacity discussions for information on Indonesia, Southeast Asia, and Mexico.

CHAPTER 3: A GLOBAL AGENDA FOR SUSTAINABLE FISHERIES

Focus Area 5

Pristine and precious places: Safeguard from further exploitation

Objective

Few corners of the globe remain untouched by fishing, and we recognize that nowhere is truly "pristine." Yet, there are many places that are closer to a natural state or condition than they are to a human-dominated environment. We believe it is crucial to seek out and establish protected areas in some of the more remote parts of the world.

Concentration of Effort and Theory of Change

Protected areas should continue to be used to set aside the most important and pristine places. Protected areas can serve several functions including, protecting biodiversity, preserving habitat, replenishing fisheries, serving as baselines for scientific research, etc. Classic conservation MPAs are very expensive; are often fraught with delineation, enforcement, and legal challenges; and it is difficult to see how it would not be prohibitively expensive to significantly scale up this work. In effect, we have created many fine examples of success in a generally worsening environment. The MPA networks that have been created, by and large, do not have the scale to be a sufficient fishery management solution.[103] [Figure 3-19]

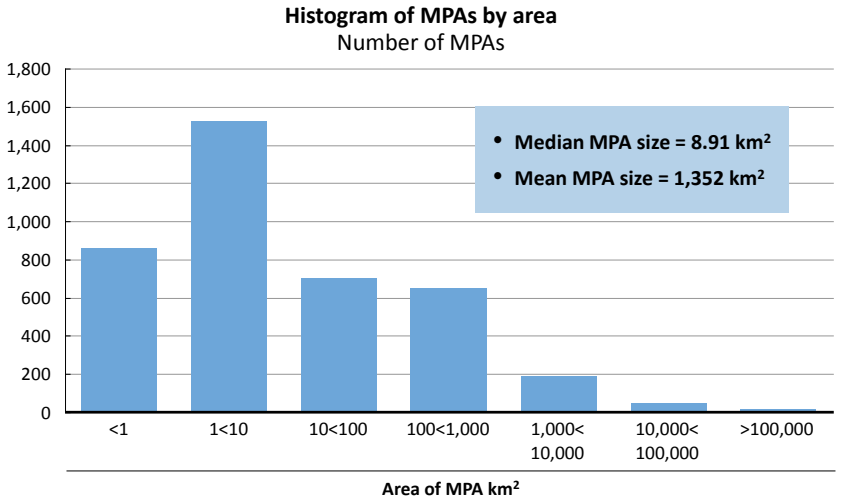
Over the next decade, the conservation community should continue to maintain its current suite of protected areas in biological hotspots (e.g., in the Coral Triangle, ETPS, MBRS, etc.), and hopefully expand that set to other biological priority regions (e.g., the Mission Blue list) particularly if there are greater funding commitments from client countries to cover the operating costs (e.g., Colombia).

In the developed world, the protection of remote areas, and areas that are currently not being fished with mobile bottom tending gear, may be used to cost-effectively freeze future expansion of fishing pressure. In parts of the world with strong fishery management, permanent protected areas are rarely used as a fishery management tool, though new models suggest that they would economically benefit even well-run fisheries. We may see the development of new coastal protected areas where momentum exists (e.g., E.U. coastal waters, California and Oregon), and these efforts would benefit from additional support from the conservation community. But setting up new protected areas is a costly endeavor, particularly in populated coastal areas, and momentum appears to be moving away from protected areas as a stand-alone tool. In the U.S., the move toward spatial management through a National Oceans Policy may create a mechanism to designate greater protections in the future, but that work appears to be at least five years off.

[103] MPAs include no-take reserves and reserves with partial protection (i.e., some extraction allowed).

Figure 3-19

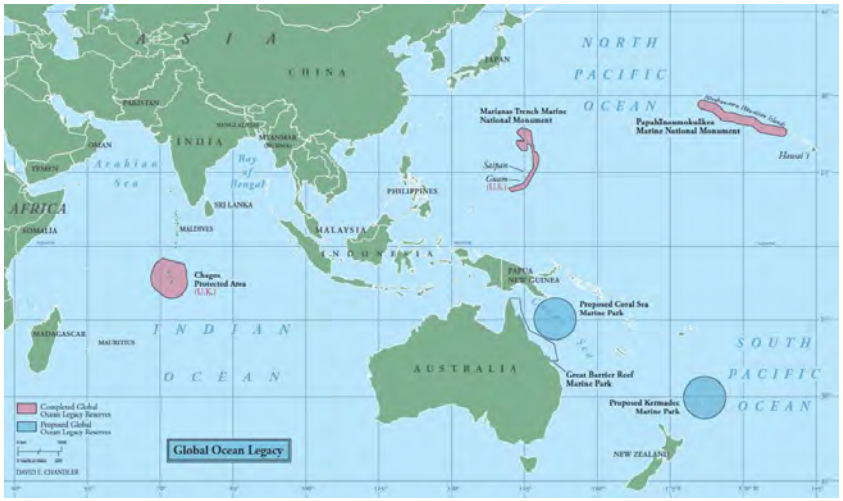
Most of the existing MPAs are small in size



Source: MPA Global at Sea Around Us and CEA analysis

Figure 3-20

Global Ocean Legacy projects



Source: Pew Environment Group

Focus Area 5 – Pristine places (continued)

In the developed world, the conservation community should prioritize promising efforts to preserve the remaining handful of pristine areas under developed world jurisdiction. Specifically, that would include:

- **Global Ocean Legacy.** The set of priority areas identified and being targeted by Pew's GOL (e.g., Chagos, Coral Sea, Mariana Trench, and Kermadecs). These areas were selected due to their relatively remote locations, limited fishing pressure, and the legal ability to create sweeping protections with the stroke of a pen. [Figure 3-20]
- **The Arctic.** NRDC, Pew, WWF, Oceana, and others have already initiated political efforts to negotiate a fishery refuge or protected area in the Arctic. In the face of climate change, preserving the integrity of the Arctic ecosystem could offer a fishery refuge of last resort for some species. Advocacy around fisheries is likely to play second fiddle to the regional politics of sovereignty, oil and gas, and shipping lanes, which could either complicate efforts or create the opportunity for a political compromise.
- **The High Seas.** The feasibility of large-scale MPAs in the high seas remains a legal question mark. If it proves feasible, new no-fishing areas would be an important mechanism to help protect open ocean marine wildlife populations.

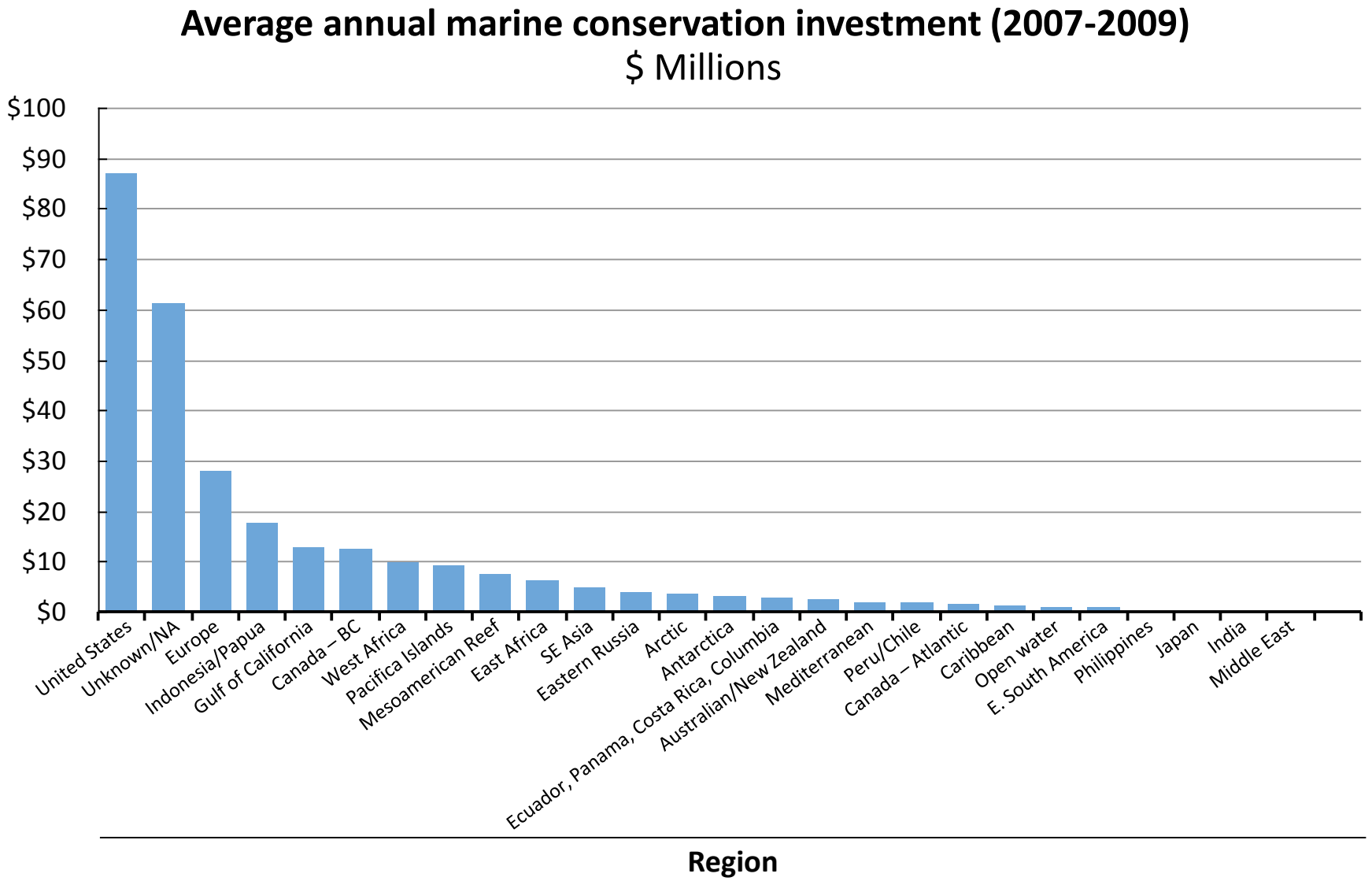
Existing Capacity

[See Appendix 7 – Regional Fishery Summaries]

- **High Seas – Moderate:** A handful of organizations are actively working on high seas protection. The key players include Pew's GOL campaign; GEF's new effort on Areas Beyond National Jurisdiction and their project for management of seamounts in the Southern Indian Ocean; the efforts of NRDC, Ocean Conservancy, Oceana, Pew, and WWF to freeze the footprint in the Arctic; the Deep Sea Conservation Coalition's efforts to reform the multilateral management of deep-sea fisheries on the high seas to secure broad protection for vulnerable deep-sea ecosystems and species (e.g., Ecology Action Centre, NRDC, Greenpeace, Marine Conservation Institute, and Seas at Risk); and a handful of efforts to promote high seas MPAs (e.g. Pew, Oceana, Greenpeace, High Seas Alliance).

Figure 4-1

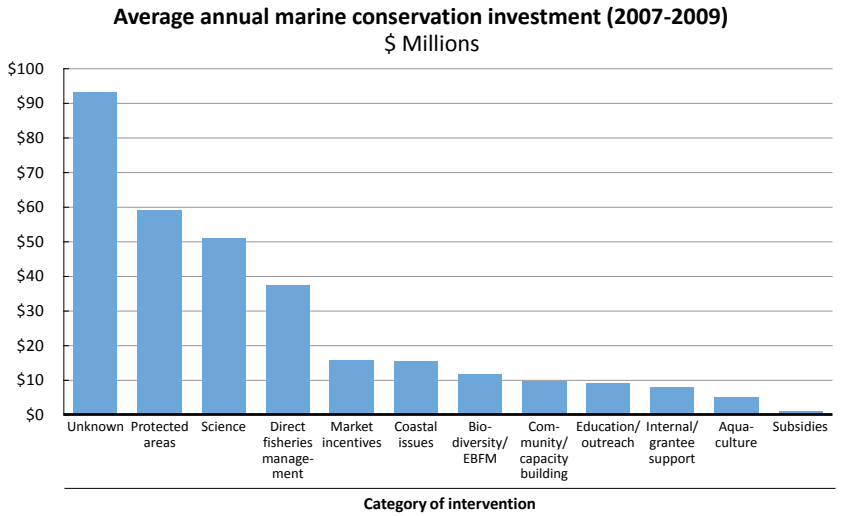
Marine conservation investment, by geography



Source: Foundation websites, annual reports, personal correspondence, and CEA analysis. Excludes Packard's MBARI support.

Figure 4-2

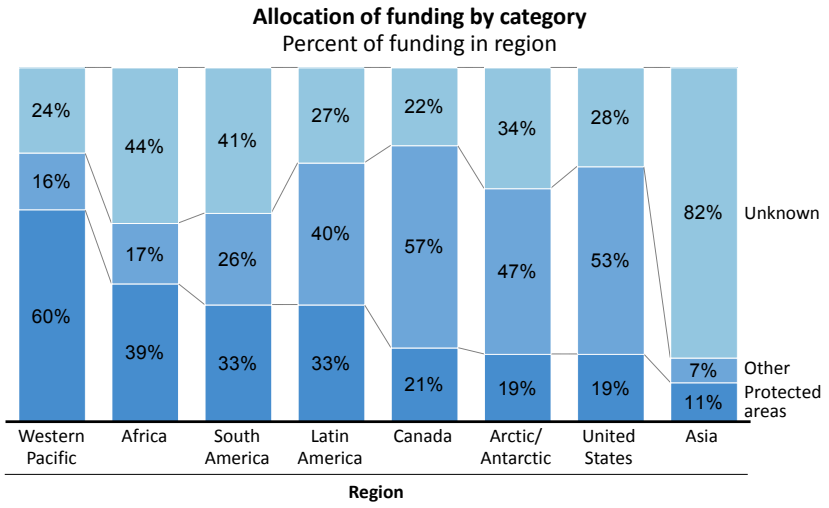
Marine conservation investment, by type of intervention



Protected areas includes MPAs with various levels of protection (i.e., no-take areas, partial use restrictions, ocean zoning, etc.)

Figure 4-3

Funding emphasis on protected areas



Conclusion – While solutions exist, current efforts are not fully aligned with the need

Today, the environmental community (NGOs and foundations) invests more than $300 million dollars annually in support of marine conservation. Investment is heavily concentrated in a few regions, including the U.S., the Coral Triangle, the Gulf of California, and British Columbia. [Figure 4-1] The interventions have focused largely on protected areas and spatial management, both in the developed and developing world, along with fisheries management, education and outreach, science, and market-based incentives. [Figure 4-2] These investments have played an important role in advancing marine conservation, but there are several important regional and subject matter gaps that must be filled. [See Appendix 9 – Conservation Funding Landscape]

Most importantly, fisheries policy in the industrializing and developing world has not been a major emphasis in the conservation community, and small scale fisheries, particularly in biodiversity hotspots, require solutions which go far beyond the current reliance on MPAs. [Figure 4-3] On the whole, the overall resources needed may already be available. Of the $300 million in current marine conservation spending, 60% is already focused on the focal areas outlined in this report, with the remainder spread over supporting initiatives such as marine science, consumer education, and community outreach. Redirecting some of the existing funding could have lasting benefits in the effort to stop global overfishing. We recognize that each of these supporting initiatives represents a valuable effort in its own right, and would only suggest that those initiatives should be closely examined for their costs and benefits relative to the portfolio of initiatives outlined in this study. Some of the hard choices that may need to be made include:

- Transitioning from a national to a global focus. We invest close to $100 million dollars per year on marine conservation in the United States, nearly three times the amount of the next highest recipient, Europe. The huge accomplishments that have been realized in the U.S., such as MSA reform, catch share implementation, California's Marine Life Protection Act (MLPA), and the National Oceans Policy (NOP), are no doubt attributable to the large amount of focused investment in the U.S. While there is still significant work to do in the U.S. to cement recent gains, to address stocks that are still being overfished, and to promote advanced concepts in marine management, a global effort to tackle overfishing must consider directing funding and attention to areas with more pressing crises. There are clear gaps in effort for some very important fishing regions, including South America, North Asia, the Mediterranean, and East Africa. While capacity is a limitation, it can be built over time.

- Adapting and broadening the protected area focus in the developing world. Fisheries policy advocacy and analysis is currently limited, especially in regions outside of the U.S. [see Figure 4-3] The focus on MPAs is creating essential protections for many biologically critical areas, but MPAs are expanding slowly and proving expensive to maintain. For example, the seascapes effort in the Coral Triangle requires more than $10 million dollars in investments each year, while the broader fishery context in the region continues to deteriorate. If all $300 million dollars in current marine funding were allocated to establishing and operating effective, large-scale protected areas, this approach would still only cover 300,000 square kilometers of ocean; an area about the size of the state of California. The same coverage with smaller MPAs would be ten times as expensive. The conservation community should move from a "pure play" MPA focus in biodiversity hotspots towards systemic change in fishery policy, which combines basic input controls with well-established CBFM approaches – especially those blending no-take reserves (essentially MPAs) with territorial use rights, at an appropriate scale.

Conclusion – While solutions exist, current efforts are not fully aligned with the need

- Building technical and political capacity as a cross-cutting need. The global marine conservation community has huge gaps in policy advocacy and technical fisheries capacity in most parts of the world, as the field is rightfully dominated by biologists, not lobbyists or economists. A much stronger political presence is needed in the major fishing countries. Similarly, fishery managers in the industrializing and developing world all too often work in an analytical vacuum, with no data on stock health, landings, or even the basic economics of their major fisheries. This presents a major opportunity for the conservation community to help these countries make quantum-leaps in their understanding of better fishery management. Our examination of Mediterranean bluefin tuna and the Gulf of Mexico snapper fishery demonstrates that the fisheries' tragedy of the commons is driven by a complex set of stakeholders and economic incentives unique to each fishery. Only through understanding these idiosyncratic dynamics is it possible to design politically viable management measures that have a realistic chance to restore these fisheries. The conservation community should help create world-class analytical, economic and fishery management expertise at the service of countries interested in optimizing the yield of their fisheries.

The resources exist to end global overfishing within two decades. The marine conservation community will need to reallocate some funding within the overall portfolio. To reach all of our priority and stretch targets, we will undoubtedly need to seek greater investments. And most importantly, we will need to better coordinate our efforts, both across market and policy interventions, and between the business, environmental, and multilateral communities. But the simple truth is that global fisheries are a critical biological and economic resource, providing sustenance to millions. Their current misuse is one of the most wasteful tragedies of our time. This crisis can be solved. We just need to act now.

Box 5: Notes about FAO Data

Many of the stats and figures in this report are based on reported fisheries landings from FAO FISHSTAT and/or the Sea Around Us Project, which provides some extension of FAO data. Obtaining fisheries landings data for all countries is a difficult task, and thus there are several caveats that are worth mentioning about the data. The data are all self-reported, and thus may be subject to reporting bias. Additionally, it is not clear how much some countries actually know about their small-scale fisheries landings, thus FAO data may not accurately capture small-scale landings. For those interested, the FAO has a paper that describes the methodology for compiling their fisheries data.[104] Although there are many caveats to be aware of when interpreting data from FAO, it remains the best available source of data for global fisheries.

[104] Garibaldi, Luca. 2011. The FAO global capture production database: A six-decade effort to catch the trend. Marine Policy 36: 760–768