“Arm the Fish!”: Addressing the Global Challenges of Marine Protected Areas

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Task Force Policy Report:
"Arm the Fish!": Addressing the Global Challenges of Marine Protected Areas

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Instructor:
Hon. Brian Baird, Ph.D.

Evaluator:
Director Rebecca Lent, Ph.D.

Task Force Coordinators:
Gee Lee
Genesee Rickel

Task Force Editors:
Brittany Cook
Elizabeth Cook

Task Force Communications Consultants:
Erica Petru
Kristin Slouber

Task Force Members:
Antonio Espino
Carolyn Gilbert
Christena Berner
Dustin Dacuan
Kenna Pearson
Kevin Rowland
Matthew Fitzgerald

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List of Acronyms

AFF: Asset Forfeiture Fund

AIS: Automated Information System

AUVSI: Association for Unmanned Vehicle Systems International

CBMRM: Community-based marine resource management

CCAMLR: Center for the Conservation of Antarctic Marine Living Resources

CCSBT: Commission for the Conservation of Southern Bluefin Tuna

CHICOP: Chumbe Island Coral Park Project

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora

CPR: Common property resource

DOD: Department of Defense

EEZ: Exclusive Economic Zone

EMS: Electronic Monitoring System

EO: Electro Optical

EU: European Union

FMV: Full Motion Video

GIS: Geographic Information Systems

GPA: Global Positioning System

ICCAT: International Commission for the Conservation of Atlantic Tunas

IMO: International Marine Organization

IPOA: International Plan of Action

IPOA-IUU: International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing

IR: Infrared

ISO/IEC: International Organization for Standardization/International Electrotechnical Commission

IUCN: International Union for the Conservation of Nature

IUU: Illegal, unreported, and unregulated (fishing)

LRIT: Long Range Identification and Tracking

MDA: Maritime Domain Awareness

MLPA: Marine Life Protection Act

MPA: Marine Protected Area

MPRU: Marine Parks and Reserve Unit

MSC: Marine Stewardship Council

NAFC: North Atlantic Fisheries Organization

NASA: National Aeronautics and Space Administration

NEAFC: North East Atlantic Fisheries Commission

NGO: Non-Governmental Organization

NMSA: National Marine Sanctuaries Act

NOAA: National Oceanic and Atmospheric Administration

NOAA's OLE: NOAA's Office of Law Enforcement

NPAFC: North Pacific Anadromous Fish Commission

OSPAR: Convention for the Protection of the Marine Environment of the North-East Atlantic

PIPA: Phoenix Islands Protected Area

POCA: Proceeds of Crime Act

R&D: Research and Development

RFBs: Regional Fishing Bodies

RFMOs: Regional Fisheries Management Organizations

SAC: Stakeholder Advisory Committee

SAR: Synthetic Aperture Radar

SCRS: Standing Committee on Research and Statistics

SENPF: St. Eustatius National Parks Foundation

SOLAS: International Convention for the Safety of Life at Sea

TBT: Technical Barriers to Trade

TEK: Traditional environmental knowledge

UA: Unmanned Aircraft

UAS : Unmanned Aircraft Systems

UN: United Nations

UNCLOS: United Nations Convention on the Law of the Sea

UNEP: United Nations Environment Programme

UNEP-WCMC: United Nations Environment Programme World Conservation Monitoring Center

US: United States of America

USAID: United States Agency for International Development

USD: United States dollars

USGC: United States Coast Guard

VMS: Vessel Monitoring System

WTP: Willingness to pay

WTO: World Trade Organization

WWF: World Wildlife Fund

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Forward

This Marine Protected Areas Task Force has drafted a policy paper to contribute to ongoing international discussion and negotiations regarding the ocean's natural resources. Our Task Force document outlines recommendations for making better use of MPAs as an ecosystem-based conservation method. The following recommendations could prove effective for weak MPA management and enforcement systems under the jurisdiction of developing nations, as well as MPAs outside national jurisdiction. Scientists have estimated that in order for protection measures to have a positive impact on a global scale, designated MPAs must cover 20 percent of the world's oceans. The real challenge, however, is in ensuring these 'protected areas' are indeed protected. Many existing MPAs have fallen into a "paper park" description, lacking the necessary resources and legislation to properly enforce MPA rules. In order to improve existing MPAs and plan for their future use as a mechanism in global coast and ocean stewardship, our policy recommendations adopt a multilateral approach in the legal, monitoring, enforcement, and funding spheres.

Executive Summary

Genesee Rickel

"Marine Protected Areas" declare specific marine spaces subject to unique legal protection, and currently serve as the most comprehensive approach to ecosystem conservation. In this report, MPAs have been categorized into three specific kinds of sites: small scale/coastal MPAs, large scale/cross-regional MPAs, and high seas/international MPAs. MPAs can be effective tools in limiting threats and promoting the resiliency of marine areas. Of the many threats pressuring the health of ocean environments, this Task Force has chosen to focus on IUU fishing. Our policy recommendations seek to strengthen the existing legal and logistical frameworks in weak, "paper park," MPAs, in order to promote sustainable fishing practices within their bounds.

Key Policy Considerations

- A stronger and more cohesive rule of law supporting MPAs is required for MPAs to be effective. The legal policy objective is to augment and strengthen international legal guidelines that can support the protection and enforcement of MPAs in developing countries.
- Current monitoring and enforcement practices leave MPAs unprotected. They must be re-examined in accordance with technology considerations in order to better monitor and enforce MPAs.
- MPAs currently lack the necessary funding to serve as effective methods of conservation. MPAs should employ a variety of funding strategies in order to generate sufficient income to fund substantial conservation.

Background

The current legal structure for MPAs is conflicting, fragmented, and often times absent. By strengthening the rule of law, developing nations will have the legal tools necessary to enforce MPAs. Many MPAs are "paper parks" because they lack the enforcement mechanisms to effectively monitor illegal activity. To address this issue, new monitoring and enforcement

mechanisms must be sustainable both in terms of operating logistics and in terms of funding. Currently, lack of adequate funding leaves MPAs incapacitated. This financial stress also prohibits MPAs from becoming more than mere "paper parks". In order for MPAs to serve as successful conservation mechanisms, the legal, monitoring, enforcement, and funding challenges must be addressed.

Policy Considerations

To address both the current gaps in legal policy and the overlapping contradictions in existing policies, MPAs are in need of a cohesive legal platform; a platform that closes the jurisdictional gaps and supports necessary institutional changes in enforcement. An effective legal structure needs to be supported by sufficient monitoring and physical enforcement capabilities. Monitoring, surveillance, and enforcement actors of MPAs should consider some of the following options: utilize surveillance technology, inform stakeholders about MPA regulations through educational campaigns, and/or form multilateral partnerships with other nations for enforcement assistance. All of the aforementioned options come at a price, and in order to afford it, many MPAs will need to improve their funding strategies. While MPAs can face a variety of funding constraints, such as limited staff and competing interests of stakeholders, there are still some unexplored and underutilized financing options. Crowdsourcing is one such unexplored option, and endowments and higher user fees are also greatly underutilized.

Key Recommendations

1) To address MPA legal challenges:

    a. At point of catch:
        i. All nations must sign UNCLOS.
        ii. Include text on asset forfeiture in the UNCLOS (including requirements regarding international coordination and funding delegation).

iii. Include text authorizing international cooperation in the monitoring and enforcement of international MPAs into UNCLOS.

b. At point of sale:

i. Modify CITES Appendix 2 to regulate import control in addition to export control, and add depleted commercial fish species to Appendix 2 of CITES treaty.
ii. All fishery products must be labeled and certified at point of sale.

c. Community level MPAs

i. Solidify property rights and conservation legislation in developing nations.
ii. Encourage community-based MPAs to define clear community goals and rules, where feedback can facilitate their shaping and improvement.

d. Specific recommendation for the United States:

i. Sign the UNCLOS treaty.
ii. A formal request should be made by US government representatives at the annual UNCLOS conference, for parties to include the fish stocks 'surrogate enforcement' clause in UNCLOS law.

2) To address monitoring and enforcement MPA challenges:

a. Community-level MPAs

i. Create new funding models to pay for more surveillance technology and more surveillance personnel.
ii. Implement Community Based Marine Resource Management (CBMRM) to engage stakeholders, create advisory groups, and draft sustainable enforcement and monitoring plans with the help of the community.
iii. Buy more mooring buoys to mark off the boundaries of the MPA.
iv. Create education, media, and publicity campaigns targeted at all stakeholders, to inform them of MPA regulations and policies following the model of interpretive enforcement.

b. Large, cross-regional MPAs in EEZs

i. Form partnerships with developing nations and NGOs for satellite based AIS systems and data sharing technology, in order to improve large MPAs within EEZs, as well as high seas MPAs.
ii. Cultivate relationships with those agencies and NGOs offering free or low cost equipment for VMS and AIS systems.

c. International High Seas MPAs

i. Implement shared EEZ policies that govern how to large areas such as EEZs and the open ocean.
ii. Within established developing-developed nation partnerships, developed nations must work with developing nations when satellite imagery, aerial surveillance imagery, and other technologies are required in criminal investigations.

3) To address funding challenges, MPAs should:

a. Community-based and coastal MPAs

i. Create long-term endowments to cover management and operations costs.
ii. Conduct willingness to pay studies in all MPAs to determine highest WTP. Use study results to determine fee structure per MPA.
iii. Recruit volunteers in local MPAs to reduce labor costs.
iv. Create crowd-source funding websites such as Kickstart to generate funding.
v. Create local, regional, and national MPA networks to share funding revenues.

b. High Seas MPAs

i. Create long-term endowments to cover management and operations costs.
ii. Create local, regional, and national MPA networks to share funding revenues.

Chapter 1: Background

Brittany Cook, Elizabeth Cook, Antonio Espino, Erica Petru, and Kenna Pearson

Chapter Summary

Elizabeth Cook

Marine protected areas are one of the most common approaches to marine ecosystem conservation. Within their bounds MPAs serve to regulate or eliminate destructive activities, including destructive fishing practices, resource extraction, and tourism activity. In this report, MPAs have been categorized into three sizes: small scale, large scale, and wide-range international MPAs. 'Small scale' MPAs refer to those in the indigenous communities of developing nations, while 'large scale' MPAs are those potentially cross-regional MPAs within the EEZs of developing nations. International MPAs are those outside of EEZ jurisdiction.

Though MPAs do not address all of the current threats to ocean ecosystems, they are effective in limiting various threats and promote the resiliency of marine areas. Of the many threats ocean environments face, this Task Force has chosen to specifically address overfishing/IUU fishing. By regulating fishing to promote trophic health and abundance of marine life, MPAs increase the likelihood of recovery from pressures such as ocean acidification and coral bleaching. Because the sources of non-point threats like coastal development, surface water runoff, and pollution are often decentralized and numerous, choosing to respond to destructive fishing practices is in some ways a simpler and more direct approach to protecting marine life. For these reasons, our policy recommendations focus on the legislative, logistical, and political frameworks surrounding MPAs and fishing practices, and how we can improve these frameworks to better protect our ocean ecosystems.

What are 'Marine Protected Areas'?

Brittany Cook

'Marine protected areas' currently serve as one of the most widely recognized approaches for addressing conservation issues in marine ecosystems; non-point source threats and point-source threats alike. An MPA can be found today at any of over 6,000 sites around the globe, from the Galapagos Islands in Ecuador to the Pemba Channel Conservation Area in Tanzania.[1] The number of established MPAs has increased dramatically over the years; in 1970 there were only 118 documented MPAs in existence.[2] In the hopes of conserving our precious ocean resource and all the organisms that inhabit its ecosystems, specific areas have been marked and declared under special legal protection. The United States' Executive Order 13158 defines an MPA as "any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein."[3] Types of sites range from reserves to refuges, preserves, sanctuaries, and more and are marked for varying levels of access by tourists, fishermen, local populations, etc. dependent on the specific condition and health of the site. MPAs play a vital role in managing and monitoring the effects of human activity.

But even with an increasing awareness of the environmental issues and human threats to marine systems, we are only in the very beginning stages of addressing a large-scale, global challenge. Today's science says that up to 40 percent of the oceans need to be protected in order

[1] World database of protected areas. United Nations Environment Programme: World Conservation Monitoring Centre. 2009. <http://www.wdpamarine.org/Default. aspx#/countries/about>.
[2] Bavinick, J., Pierre Failler, and Andy Thorpe. "Marine Protected Areas (MPAs) Special Feature: Editorial." Environmental Management: Vol. 47, Issue 4. Springer New York: April 1, 2011. 519-524….
[3] Office of Ocean and Coastal Resource Management, NOAA Ocean Service. Silver Spring, MD 20910, U.S.A. April, 2011. <http://www.mpa.gov.offcampus.lib.washington.edu/pdf/_helpful-resources/us_mpas_snapshot.pdf>.

to ensure long-term conservation and recovery,[4] and according to the World Database on Marine Protected Areas, less than one percent of the ocean is currently protected. Environmentalists, and various other stakeholders with vested interests in the sustainability of the seas, know that many regions still have a long way to go in ensuring the maintenance and protection of their existing MPAs. Both small and large reserves with "no-take zones," where any activities outside scientific monitoring that alters habitats are strictly prohibited, are necessary to ensure sustainability and keep a watchful eye on the species that call these areas home.

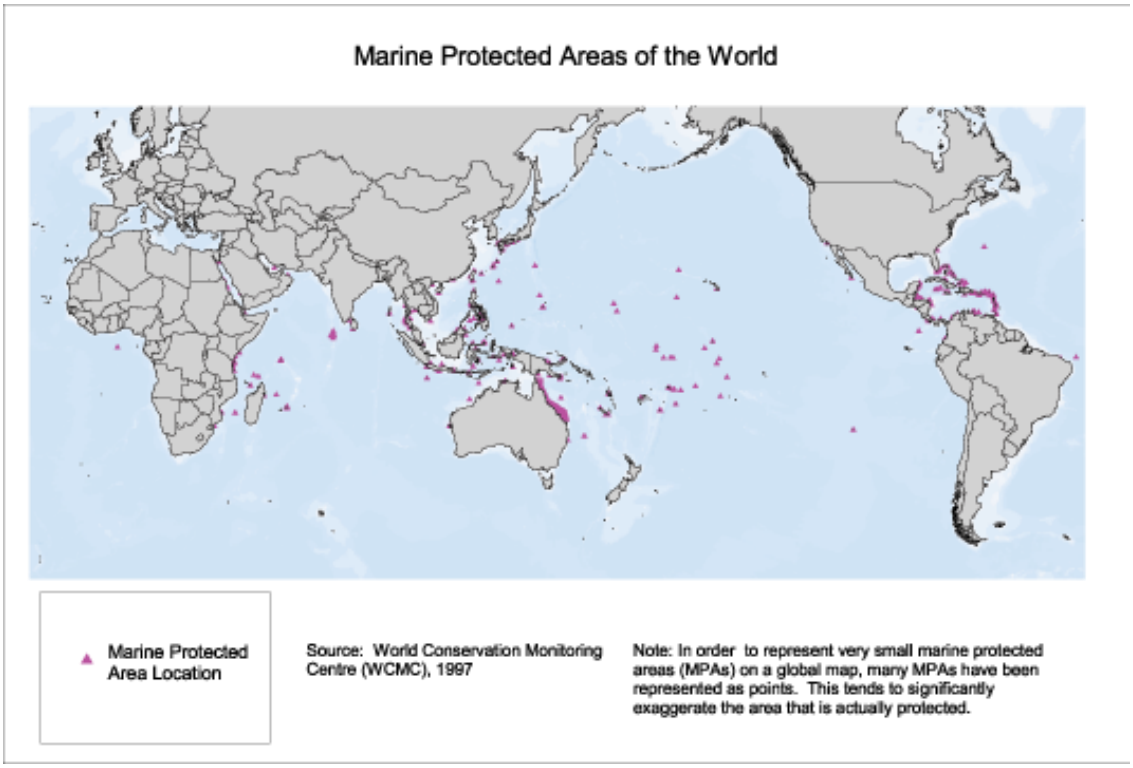

Figure 1: Basic map of the world's designated MPAs; represented here by purple triangles.[5]

[4] *High Seas MPAs : Regional Approaches and Experiences*. United Nations Environment Programme. 12th Global Meeting of the Regional Seas Conventions and Action Plans…
[5] "Marine Protected Areas of the World." World Resources Institute. September 25, 2008. <http://www.wri.org/map/marine-protected-areas-world>.

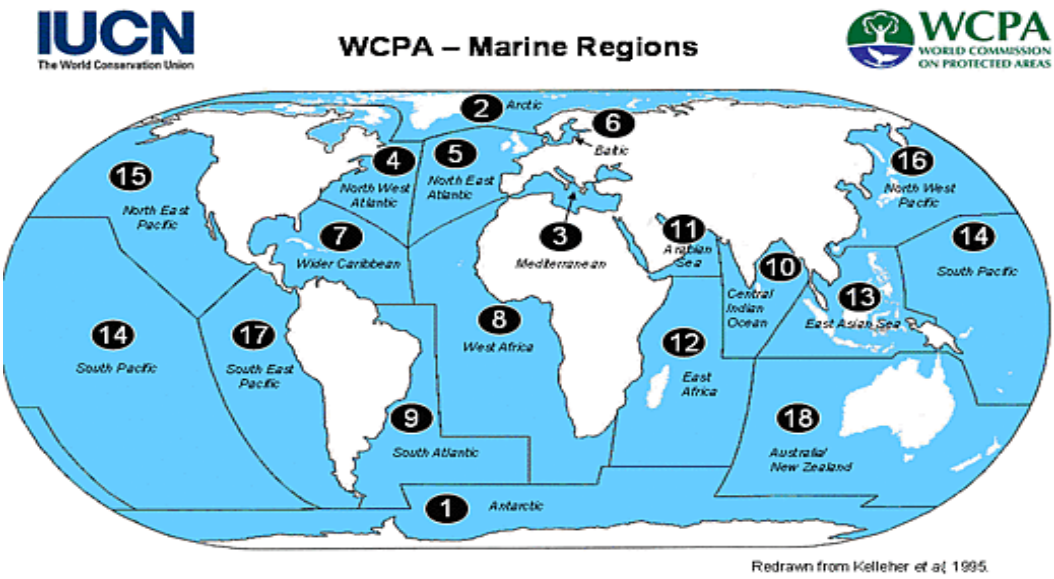

Figure 2: The world's 18 marine ecosystem regions, as designated by the WCPA.[6]

Brief History

Protected areas of some degree have existed alongside fishery management policy for years. With respect to ecosystems however, MPAs are a more conservative and preventive approach than most other fishery management techniques. The first U.S. national marine sanctuary was established in 1975 at Cape Hatteras, North Carolina, but the National Park Service has been operating parks in marine coastal environments since 1947.[7] Over the years many other countries have set their own national targets for conservation and put forth plans for implementation. In 1947 the UN Framework Convention on Climate Change identified the need for countries to start collaborating with one another and established regional conservation plans, which, in action, became known as the "Regional Seas Programmes." Coordinated by the UNEP,

[6] Marine Plan of Action Photo. From Kelleher, G., Bleakley, C., and Wells, S., (eds), 1995. WCPA. < http://iucn.org/about/union/commissions/wcpa/wcpa_what/wcpa_marine/ wcpa_marineaction/>.
[7] "Clarifying Misconceptions About Marine Protected Areas." National Marine Protected Areas Center: U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Protected Ar…

the regional action plans include measures for dealing with marine emergencies, information management, and monitoring pollution.[8] Today, more than 143 countries participate in 13 Regional Seas Programmes. New MPAs are being established as more countries and organizations begin to understand the lasting value and economic potential of marine environments. The Australian government for example released a plan in November of 2011 for designating what will be, so far, the world's largest MPA (989,842 square km).[9] Though the history of MPAs as we know them today may be relatively short, it is hoped that the legacy of MPAs has only just begun.

Why Protect a Marine Area? – Threats to Ocean Ecosystems

Brittany Cook, Erica Petru, and Antonio Espino

MPAs attempt to regulate and eliminate a number of different threats to marine ecosystems. Properly managed MPAs have experienced dramatic increases in biodiversity, species abundance, and overall health. On average, MPAs increase compositional species diversity by 20 percent and increase abundance by 160 percent. Furthermore, the restoration of natural selection leads to an increase in the size of fish present in MPAs. MPAs also cause shifts in trophic relationships to better reflect the health of pristine environments and have higher proportions of large predators than those of overfished ecosystems.[10]

MPAs have the potential to produce lasting benefits not only for the marine life and ecosystem itself, but also for local human communities and the sustainability of their economy. A variety of industries are dependent on the health and abundance of underwater life. Local communities benefit economically through tourism, recreation, and fish and seafood sales.

[8] "About." United Nations Environment Programme: Environment for Development. Regional Seas…
[9] "Australian Government Releases Proposal for Large Coral Sea MPA; Stakeholders Respond." MPANews. Vol. 13, No. 4: January-February 2012. <http://depts.washington.edu/mpanews/MPA124.htm#coralsea>.
[10] Enric Sala (Marine Ecologist) in video conference with the authors, January 2012.

Continued marine sustainability helps support a number of important jobs for stakeholders in these industries.[11] For example, Bonaire Marine Park in the Caribbean is funded entirely by tourist revenue and is responsible for half of the country's total GDP. A fishing reserve in the Philippines has also been able to recover its stocks and provide local fishermen with much greater increases in yields. These shining examples help illustrate the need for continued support from local community members, visitors, policy makers, international organizations, and environmental institutions.[12] Marine and coastal protected areas continue to prove themselves as our most essential tool in conservation and sustainability of marine and coastal biodiversity.

Point-Source Threats: Destructive Fishing Practices

Erica Petru and Antonio Espino

Introduction

Though MPAs cannot address *all* of the current threats to ocean ecosystems, they are effective in limiting threats and promoting the resiliency of marine areas. By regulating fishing and controlling tourism, MPAs increase the likelihood of recovery from pressures like ocean acidification and coral bleaching.[13] Furthermore, because the sources of coastal development, surface water runoff, and pollution are often decentralized and numerous, responding to destructive fishing practices is in some ways a simpler and more effective approach to protecting marine life. For these reasons, our policy recommendations are focused on the challenge of IUU fishing in designated MPAs. This section will outline some of the general point-source threats to ocean ecosystems, most explicitly destructive fishing practices. We then proceed to discuss the

[11] "How can MPAs and reserves help?" ProtectPlanetOcean. 2010. <http://www.protectplanet ocean.org/collections /introduction/introbox/whyweneed/introduction-item.html>.
[12] "Marine Protected Areas of the World." World Resources Institute. September 25, 2008. ..
[13] UNEP, 8.

fishing issue specific to MPAs today, i.e. IUU fishing. This opening chapter concludes with an outline of the three specific 'categories' of MPAs that the Task Force team has chosen most relevant for our purposes.

Trawling

One particular fishing practice that can be detrimental to ocean ecosystems is trawling.[14] Although trawling is highly regulated in some places, the motivation to obtain a large catch leads fishers to circumvent regulations. This competitive atmosphere results in detrimental environment impacts. Bottom trawling uses weights to keep the net on the ocean floor, and while it is successful in catching shrimp and fish, it levels the sea floor and crushes any marine life in its way (refer to Figure 1).[15] Trawling also results in massive quantities of by-catch, often harming critically important species like sea turtles.[16] Though technology exists to reduce by-catch, such technology has been slow to spread to nations with large numbers of shrimp fisheries and other bottom trawlers.[17] Shrimp fisheries also discard the largest amount of biomass relative to their catch: between 3 and 15 times the amount of the total biomass they catch. This statistic demonstrates the wastefulness and environmental damage that this industry causes.[18]

[14] Tietze, Uwe. 2005. *Economic performance and fishing efficiency of marine capture fisheries*. Rome: Food and Agriculture Organization of the United Nations.
[15] Nellemann, Hain, and Alder, 47.
[16] Hall, Martin A., Dayton L. Alverson, and Kaija I. Metuzals. 2000. "By-Catch: Problems and Solutions". *Marine Pollution Bulletin.* 41 (1-6): 204-219, 205.
[17] Hall, Alverson, and Metuzals, 212.
[18] Ibid.

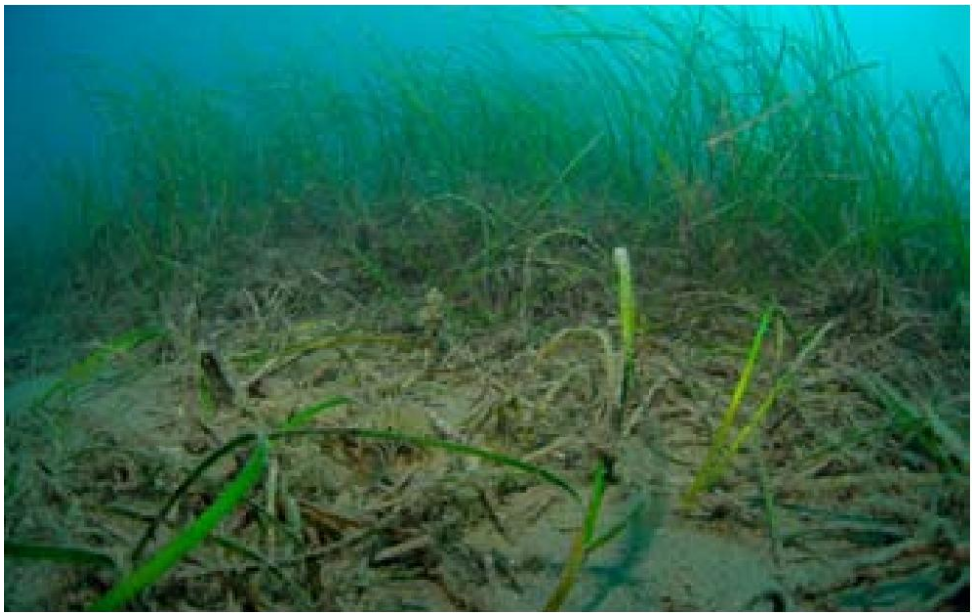

Figure 3: The impacts of bottom trawling on the sea floor.[19]

Longline Fishing

Longline fishing is a practice in which fishers install multiple hooks on a long fishing line. It is harmful to species living in submarine canyons, marine birds, and deep-sea coral reefs. Long-lining became a prominent fishing practice after techniques like drift-netting and seine-netting were banned from many fisheries. Longline fishing is common in productive areas, like submarine canyons, which are home to a wide variety of marine biota and provide suitable shelter for fish nurseries.[20] The large number of commercial species present in these areas attracts fisheries, which cause harm through by-catch and habitat destruction for these vital nursing grounds. Destruction to nurseries forces juveniles out of the submarine canyon where they are more vulnerable to predation.

[19] Nellemann, Hain, and Alder, 49.
[20] Baker and Fontaubert, 53-60.

Overfishing

Within the realm of both high seas and coastal marine ecosystems, overfishing is a problem that inflicts considerable damage. Overfishing and excessive fishing can reduce the spawning biomass of a fishery below the maximum sustainable or economic yields.[21] Fishing practices can alter ecosystems by affecting the target resource, species associated with or dependent on the targeted resource, trophic relationships within the ecosystem, and the habitats in which the fishing occurs.[22] When overfishing is sustained over time, changes can occur in species composition and biodiversity in terms of reducing large, long-lived, and high value predator species and the increase in small, short-lived, and lower value prey species.[23] This process is described as "fishing down the food chain" and is evident in the macroscopic changes that have occurred in ecosystems in the North Atlantic, Gulf of Thailand, and southeastern Australia.[24] Overfishing practices can additionally lead to reduced genetic diversity of wild populations, and provoke changes in species composition or dominance through competition for food.

If left unchecked, overfishing will inevitably destroy marine ecosystems and jeopardize the food security of more than a billion people. Scientists believe that if current fishing trends continue, world food fisheries could collapse entirely by 2050.[25] Currently, the statistics on global fisheries health are more than disconcerting: about 75 percent of the world's fish stocks are being harvested unsustainably, 80 percent are already fully exploited or in decline, and stock

[21] Oliver et al. "World inventory of fisheries. Impacts of fishery activities" FAO Fisheries and Aquaculture Department (online).
[22] Ibid.
[23] Ibid.
[24] UN FAO Fisheries. *State of World Fisheries and Aquaculture* 2002.
[25] Worm, et al. (2006) *Impacts of biodiversity loss on ocean ecosystem services*. Science, p. 787.

of large predatory fish (tuna, sharks, swordfish, cod, and halibut) have been reduced by 90 percent.[2] These striking numbers prove how imperative it is that strong, protective ocean policy measures be implemented now. Marine protection offers us a chance to reverse the damage that has been done by overfishing practices around the world.

Blast Fishing

Although reefs cover less than .0025 percent of the marine environment, they are considered the 'rainforests of the seas' for their high levels of biological diversity and productivity.[26] These vital ecosystems support roughly 4000 species of fish and 800 reef-building corals worldwide.[27] Explosives used for fishing purposes, otherwise known as blast fishing, pose a serious threat to coral reefs and their inhabitants. Blast fishers bomb underwater coral reefs, killing or stunning the majority of fish within the blast radius. Fish then float to the surface, where they can be easily caught.[28]

Figure 4: Image of a fisherman in the Philippines blast fishing on a coral reef.

[26] Wabnitz et. al. *From ocean to aquarium*. UNEP-WCMC. 2003. P. 9.
[27] Ibid.
[28] World Wild Life. *Corals*. 2006.

The explosives, typically made from potassium nitrate, not only kill the surrounding fish, but also the surrounding inedible reef animals and large predators. However, most of the damage from blast fishing is caused by the destruction of the corals from the initial explosions. Because coral larvae require a solid structure upon which to attach and rebuild, it is very difficult for new growth to occur in an environment of rubble and dust, and future coral growth is thus greatly inhibited.[29] As it takes nearly a century for a coral system to recover from such blasts, continued reliance on this fishing method will eliminate almost any growth potential in a given region.[30] Unfortunately, the prevalence of this fishing technique has expanded in recent years and is now used in over 30 countries, causing major damage and loss of coral reef ecosystems. [31]

Cyanide Fishing

Cyanide fishing, like blast fishing, is a practice used to capture fish with effects spanning further than the fish caught.[32] The chemical used, sodium cyanide, is poisonous to coral polyps, and can poison and kill both fish and eggs.[33] Fish stunned by squirts of cyanide often escape into crevices, resulting in coral damage as the fishermen break apart the reef in order to catch their paralyzed prey.

The aquarium fish trade, a multi-million dollar industry centered on the demand for prize species of fish and coral, is the primary driver behind cyanide fishing. If managed sustainably, the aquarium trade has the potential to support jobs in some low-income coastal areas, and as a result, provide economic incentives for management conservation. In the long run, harvesting tactics like cyanide fishing damage this advantageous product, and the high mortality rates

[29] UN FAO Fisheries. *State of World Fisheries and Aquaculture* 2002.
[30] Fox et al. "Experimental assessment of coral reef rehabilitation following blast fishing." p. 100
[31] Caldwell et al. *Recovery from Blast Fishing on Coral Reefs: A Tale of Two Scales*. p. 1632
[32] Mak et al. *Cyanide fishing and cyanide detection in coral reef fish using chemical tests and biosensors*. p. 2583
[33] Mak et al. *Cyanide fishing and cyanide detection in coral reef fish using chemical tests and biosensors.* p. 2584

associated with inadequate handling and transport of living organisms greatly undermine this practice.[34] Collaboration between scientists and fishermen at the local and national levels is essential for managing enforcement of the aquarium fish trade, and ensuring environmentally safe and sustainable collection mechanisms.[35]

Careless Tourism

Coastal environments provide a myriad of recreational opportunities both for locals and international visitors. The tourism industry can provide funding for conservation and economic incentives, including jobs for local coastal populations. If areas are not managed properly, however, effects can be detrimental; tourists add pollution, waste, and water pressures to those of the local population, greatly impacting local infrastructure and habitats. Tourist developments are often built on or near fragile marine ecosystems; mangrove forests and seagrass meadows have been removed to create open beaches, while many pier developments are built directly on top of coral reefs. Tourist resorts often deposit wastes directly into the water surrounding the corals and other sensitive marine environments.[36]

[34] Wabnitz et. al. *From ocean to aquarium*. UNEP-WCMC. 2003. P. 9
[35] Wabnitz et. al. *From ocean to aquarium*. UNEP-WCMC. 2003. P. 10
[36] World Wild Life. *Coastal development problems: Tourism.*

Figure 5: Anchoring on a coral reef.

Figure 6: Tourists walking on a coral reef.

Additionally, recreational activities have a great impact on coastal environments. Careless boating, diving, fishing, and snorkeling have substantially damaged coral reefs around the world; people touch reefs, stir up sediment, and drop anchors. In some islands, the resorts even use dynamite in order to create passageways for boats carrying tourists towards their snorkeling destinations.[37] Tourism industries must be coupled with heavy regulation of behavior in and around marine life. Educational signs and warnings need to be in place to ensure understanding by patrons and locals about the threats to surrounding marine life. Such measures will help ensure the ability of future tourists to also experience the beauty of marine ecosystems.

Illegal Fishing in MPAs

Elizabeth Cook

Aside from climate change, overfishing is arguably the biggest threat to the oceans today. Both fishing methods and the large scale of harvests are having a devastating effect on every

[37] Zubi, Teresa. *Ecology: Reefs at risk.*

aspect of the ocean ecosystem, including its marine creatures.[38] Overfishing itself is a destructive disregard of ocean growth patterns and means of achieving sustainable fisheries. Overfishing changes species composition and biodiversity, primarily with the reduction of large, long-lived predator species, leaving an increase in small, short-lived, lower value species. This process is known as "fishing down the food chain."[39] Overfishing, however, is an incredibly fragmented issue. In this Task Force, we have chosen to approach overfishing by working with the issue of IUU fishing.

IUU fishing is a term used by the United Nations Food and Agricultural Organization. Illegal fishing is defined by those practices conducted in violation of the applicable laws and regulations, or without permission from the relevant state or managing organization. Unreported fishing is a term which covers those practices which have been unreported or misreported to the relevant national or regional authority, countering applicable laws and regulations. Unregulated fishing, on the other hand, refers to fishing practices conducted by vessels without nationality, flying the flag of a state other than that of the governing regional organization, or on stocks with no applicable conservation or management measures in place.[40]

IUU fishing is seen as one of the main obstacles to achieving sustainable world fisheries, as recent studies have put the worldwide value of IUU catches from between USD 4 billion to USD 9 billion annually. Of the catch, USD 1.25 billion is expected to have come from the high seas, the remainder being taken from coastal waters. Current fishing levels are unarguably unsustainable, and overfishing is an issue that has long remained to be tackled. Combating IUU

[38] "Big Threats: The Main Factors Destroying Ocean Health." State of the Ocean.org. Web. 31 Jan. 2012. <http://www.stateoftheocean.org/threats.cfm>.
[39] "FAO Fisheries & Aquaculture - Impacts of Fishery Activities." FAO: FAO Home. Web. 31 Jan. 2012. <http://www.fao.org/fishery/topic/12273/en>.
[40] "What Is IUU Fishing and Marine Living Resource Crime?" Www.fisheries.no. The Norwegian Ministry of Fisheries and Coastal Affairs, 24 Oct. 2011. Web. 31 Jan. 2012. <http://www.fisheries.no/resource_management/control_monitoring_surveillance/IUU_fishing_definition/>.

fishing is one means by which this monolithic issue can begin to be controlled. IUU fishing further undermines efforts to conserve and manage fish stocks, damaging economies, and food security of coastal states. In order for action to be taken in preserving marine environments, IUU fishing must first be combated. Combating the issue of IUU fishing relates to all aspects of marine conservation, as tackling IUU fishing will yield efficient methods of surveillance and enforcement. Once better enforcement is in place for environmental conservation, this can be applied on a much broader scale and address issues beyond just IUU fishing.

One important aspect of IUU fishing is its general target location. Many IUU fishermen operate in areas where monitoring, control, and surveillance are lacking, such as developing nations with minimal infrastructure or vested interest in patrolling its coastal territory. A key consideration in combating IUU fishing is thus recognizing its unequal distribution across territories, and the prevalence of IUU fishing in areas which lack the ability to stop such practices.

The global nature of IUU fishing presents a significant challenge to all parties involved in marine area conservation, ranging from global policy makers to regional governing bodies. Ocean territory can be divided into two distinctive categories: coastal waters and the high seas. IUU fishing presents a different challenge for both areas, due to issues including size, governance, and biodiversity.

Coastal Challenges

Flag State Control

A major differentiation between coastal and high seas territories is their respective governing bodies. Coastal waters, and coastal MPAs, exist under the jurisdiction of a flag State, while high seas areas do not usually have one unified governing authority. This creates unique

problems for each; coastal areas are potentially exploited by their respective flag States, while high seas areas, lacking a cohesive governing body, potentially suffer from neglect and misappropriation of responsibility.

The reliance placed on a flag State to protect its own coastal area is potentially dangerous when considering the nature of IUU fishing and MPAs. For one, it is estimated that more than 90% of the global fish catch is taken from waters under coastal State jurisdiction.[41] This fact is disheartening to consider in the context that IUU fishing largely takes place in developing nations, those States lacking sufficient infrastructure to patrol the area and prosecute offenders. In addition, some MPAs and the marine areas home to the world's greatest biodiversity exist within the jurisdiction of these developing nations. Thus, in terms of coastal areas, filling the needs of States lacking sufficient infrastructure is of utmost concern. In cases of IUU fishing in developing countries, fishermen often do not need to make a significant effort to evade surveillance and enforcement methods, and can instead flaunt their presence without gaining attention.

The lacking infrastructure of a State, however, is not the only determining factor in creating a State with poorly-managed marine territories. In poor developing countries, governments sometimes have much to gain from bribery and corrupt fishing practices, or from the less blatantly exploitive practice of granting access agreements. When a coastal State does not harvest its total allowable catch of fish in waters under its jurisdiction, it can grant access to those waters to fishers from other States. This practice potentially leads to IUU fishing, as the coastal States granting access are typically developing States lacking the capacity to effectively patrol waters under its jurisdiction. States are thus at a loss against potential IUU fishing.

[41] *Closing the Net: Stopping Illegal Fishing on the High Seas (High Seas Task Force 2006)*. Rep. Bellegarde: Sadag, 2006. Print.

Inter-State Cooperation

The IPOA-IUU, a document produced by the Food and Agriculture Organization of the United Nations in 2001, calls on its complying States to assist such developing coastal States in building the infrastructure necessary to prevent IUU fishing. An overarching problem in implementation of the IPOA-IUU, however, is obtaining the compliance of such developed nations. Inter-State cooperation remains one of the primary problems in combating IUU fishing, like in the case of most environmental legislature.

Cooperation is a key component in more than funding debacles. The smaller-scale nature of coastal territories makes it possible for fishermen to easily move among various State jurisdictions. Thus, in attempts to apprehend fishermen engaging in IUU practices, it is important for States to cooperate and share up-to-date news and information on fishing practices within its jurisdiction.

Technology

Although a State's infrastructure and political stability largely determine the initial success of any surveillance or enforcement methods it puts forth to combat IUU fishing, the type of technology implemented is also a key factor. This technology is primarily limited fiscally, and relies, as mentioned above, on inter-State cooperation. Existing technology, however, has not proven itself omnipotent in the face of IUU fishing practices. (See "High Seas: Patrol Vessels" and "High Seas: Remote Surveillance" below).

High Seas Challenges

Flag State Control

As flag States are not responsible for the patrol of high seas territories, they are alternatively responsible for the surveillance of their own vessels on the high seas. As is the case

in coastal waters, there exist many States who lack sufficient monitoring capabilities to keep track of State-registered vessels and their activity. The inadequacy - largely on the part of developing nations - of monitoring technology and techniques has led to the exploitation of such primitive States, primarily through distorted vessel registration practices and the masking of origin through 'reflagging.'

Vessel registration is a main issue of contention in IUU high seas fishing. Some States permit the registration of vessels in their territories that have no link to the State. Often, the vessel's captain, crew, and registration will all be of varied origin, and the vessel itself may rarely visit the territory in which it is registered. Vessels may also never need to visit their State of registration. Many flag States have neither the ability nor the will to monitor the fishing activities of its registered vessels, resulting in rampant unchecked IUU fishing. Vessels will often target certain States with the intent of using such lax regulation control. IUU fishing on the high seas largely constitutes a failure on the part of flag States to abide by their responsibilities within the international community.

Reflagging of vessels is also a common practice within IUU fishing cases, in order to evade detection while remaining registered to a more strictly-controlled State. The vessel may be registered in a State with relatively strong surveillance and enforcement infrastructure, but upon arriving on fishing grounds, dons the cover of a State which may be known for less stringent controls. Hundreds of fishing vessels operate under the flags of states like Togo and Panama, for example, which are known for their minimal enforcement infrastructure.[42]

Flag State control, however, is not the sole issue in combating IUU fishing on the high seas, as efficient control additionally depends on the technology and methods used. First and

[42] Proc. of High Seas Marine Protected Areas: Safeguarding Areas Beyond National Jurisdiction, Washington DC. District of Columbia Bar, Environment, Energy, and Natural Resources Section. Web. 31 Jan. 2012. <http://www.eli.org/pdf/seminars/12.16.10dc/12.16.10dcsummary.pdf>.

foremost, the large-scale nature of high seas territories must be considered. In many cases, a flag State's rudimentary technology and lack of funds renders it simply impossible to control the actions of its registered vessels in such a large area.

Patrol Vessels and Aircraft

Combating IUU fishing on the high seas presents challenges to much of the traditional technology and enforcement methods in use in coastal waters. The overall costs of monitoring activities are vast, considering the massive size of high seas territories in comparison with smaller coastal water areas. For such high seas areas, classic surveillance techniques and technology, such as patrol vessels, are not only expensive, but have limits in range that make them largely unfeasible to use on high seas territory. In addition, patrols are not only primitive in nature, but also potentially hazardous; captains have condoned the boarding of IUU vessels on the high seas on the grounds of danger to their crew. The traditional physical apprehension of pirate fishermen, commonly seen as the 'ultimate solution,' is rarely possible on the high seas. Even if patrols are able to intercept the suspect vessel, physical boardings would be too risky to conduct.[43]

Surveillance airplanes present a possible alternative to the traditional patrol boats, however such technology remains expensive at the time being. This technology also proves largely unfeasible for use by developing nations under the greatest threat of IUU fishing.

Remote Surveillance

More remote-technology-based methods of surveillance have proved unproductive in both high seas environments and coastal waters. Satellite imagery, for example, though a novel idea, is difficult to obtain in real-time, and considerable time and planning is involved in

[43] *Closing the Net: Stopping Illegal Fishing on the High Seas (High Seas Task Force 2006)*. Rep. Bellegarde: Sadag, 2006. Print.

obtaining images. The processing of satellite data has also proven to be a deterrent; the time involved in both technical processing and human reviewing of data is unfeasible. Although satellite imagery is far more detailed and accurate than many manual surveillance tools, plans must be made far in advance for the capture of specific images, and once obtained, the images undergo a lengthy processing and viewing procedure. Satellite imagery, though thorough, does not deliver the real-time data necessary in apprehending IUU fishermen. Currently, more quick-time practices have been put to use despite their rudimentary capabilities.

VMS (satellite-based tracking systems) have in recent years received much attention for success in combating IUU fishing. VMS can provide fisheries authorities with near real-time information on the positions of all licensed fishing vessels, and there has previously been no doubt that use of VMS can significantly improve the efficiency of protection and compliance efforts. However in the past few years, much research has been conducted as to the actual efficiency of VMS technology, revealing surprising results. Although documented cases of VMS use in the United States, Canada, Australia, and New Zealand have revealed vessels participating in VMS less likely to engage in detectable illegal activities, further research has shown widespread VMS tampering to elude compliance.

A 2006 Task Force study conducted by the governments of Australia, Canada, Chile, Namibia, New Zealand, and the United Kingdom revealed a prevalence of VMS tampering. Fisheries authorities in Australia, New Zealand, South Africa, and the French territory of Réunion all observed vessels transmitting false VMS positions; one vessel was observed reporting VMS data as far as 3000 nautical miles from its true position. Under further investigation, it was revealed that there are currently ready-made VMS tampering kits available for sale to vessel operators. Operators can block out the GPS equipment integrated in the VMS,

in order to input false positions into the communications module through a GPS simulator. The kits reportedly are sold for as little as USD 2500. These kits indicate VMS tampering to be a much more widespread practice than reports are led to believe; the few incidents reported would otherwise have led to a small-scale conclusion. Such an observation of VMS tampering reveals the true nature of IUU fishing: authorities can only guess at its prevalence.

A second issue with VMS use is the data sharing required to render it effective. Inter-State cooperation and data sharing is an issue in all levels of marine surveillance and enforcement both on the high seas and in coastal territories, but particularly so in reference to existing technology. In order to make useful the already existing and funded methods of surveillance, States must comply with some form of basic communication. VMS data is only effective when shared between States. There is not currently an acceptable institutional framework through which to access and distribute data. With a few exceptions in the North Atlantic, major flag States have shown reluctance to distribute data through a centralized system, or network of organizations, citing commercial confidentiality and flag State responsibility as impediments.

Finally, VMS data only provides the position, speed, and course of vessels. In short, it is nothing more than a tool to be used in enhancing monitoring, control, and surveillance in its broadest forms. It is not an end in itself, and, in combination with such studies as those described above, it is now in doubt whether fitting VMS to high seas vessels will necessarily reduce IUU fishing.[44]

[44] Vanzella-Khouri, Alessandra, Jeff Ardron, Takaomi Kaneko, and Peter Jones. "What Are the Main Challenges Facing the MPA World?" *MPA News* 12.6 (2011): 2-4. Print.

3 Categories: "Paper Parks" in Developing Countries

Brittany Cook

This Task Force report seeks to address the issues inherent in protecting existing MPAs. We will not necessarily be talking about establishing new MPAs, although we hope that some of our recommendations might also prove helpful down the line for those seeking guidance in developing successful frameworks for monitoring and enforcement policy. When considering the larger, more global problems in protecting and enforcing laws around MPAs, our group saw a specific need in developing nations. A number of developing countries struggle to take on the costs of protection and enforcement and lack the necessary legislation to deter bad actors from overfishing in their EEZs, from polluting their waters, etc. Governments and management organizations have come to accept the disappointing reality that many MPAs exist only as lines on a map, vulnerable areas with no 'teeth' to ensure that they are serving their intended purpose. These "paper parks" don't have the necessary funds or resources for quality protection. Even in other MPAs where internal monitoring processes and enforcement procedures are strong, external pressures beyond the jurisdictional control of a region can undermine the work done within the parks. In a recent global survey, this situation rang true for 383 MPAs deemed to be managing internally at high efficiency.[45] For example, Johnston Atoll, just west of Hawaii, is a coral reef MPA that has experienced an intense amount of military development, nuclear testing, chemical waste disposal, overfishing upstream of the reef which cuts off the supply of coral and fish recruits, and various other threats just outside their bounds. This Task Force will address challenges to protection by presenting three different "packages" of solutions based on the needs that we have found specific to three kinds of sites.

[45] "Marine Protected Areas of the World." World Resources Institute. September 25, 2008. <http://www.wri.org/map/marine-protected-areas-world>.

It is important to consider that MPAs vary significantly in size, jurisdiction, and purpose; the world's smallest MPA is located in Canada at Echo Bay Provincial Park, only 0.4 hectares, which is miniscule in comparison to the Phoenix Islands Protected Area of Kiribati, which covers 41 million hectares of sea and coast. Some MPAs choose to focus on biodiversity objectives, others are established for fishery management purposes, and some intend to accomplish both of these goals.[46] The most common designs used to establish MPAs are small single areas, large single areas, or a network of areas. After considering all of these distinctions, our Task Force has whittled down endless MPA regions to a more manageable focus. This team has decided it most valuable to look in depth at three particular 'categories,' which are as follows:

1. Small scale, local MPAs in the indigenous communities of developing nations (i.e. "community-based MPAs")
2. Large scale, potentially cross-regional MPAs within the EEZs of developing nations (i.e. "cross-regional MPAs")
3. International MPAs on the high seas outside of EEZ jurisdiction (i.e. "international high seas MPAs")

Each region faces the same general challenges in monitoring and enforcement, but to different degrees and with a variety of effects on their stakeholders.

Community-Based MPAs

These single area, local MPAs exist within coastal waters and usually intend to protect a unique habitat, a life cycle event like spawning, shipwrecks, species nursery grounds, or fishing habitats.[47] Coastal waters are defined by NOAA as "those areas adjacent to the shorelines, which contain a measurable quantity or percentage of sea water, including but not limited to sounds,

[46] Bavinick, J., Pierre Failler, and Andy Thorpe. "Marine Protected Areas (MPAs) Special Feature: Editorial." Environmental Management: Vol. 47, Issue 4. Springer New York: April 1, 2011. 519-524…
[47] "What are Marine Protected Areas?" ProtectPlanetOcean. 2010. <http://www.protectplanet ocean.org/collections /introduction/introbox/whyweneed/introduction-item.html>.

bays, lagoons, bayous, ponds, and estuaries."[48] Coastal MPAs usually include upland and marine/intertidal areas and are under national jurisdiction via internationally recognized EEZs. The WDPA estimated that only about 2.86 percent of the world's EEZs and 6.3 percent of territorial seas are currently protected.[49] The geographical location of these MPAs presents a unique set of threats and strategical management demands. This report will focus closely on indigenous communities where local/regional rule of law, more notably non-statutory law, maintains control.

These coastal communities are a tight-knit group; banded together through common culture and common interests. Coastal towns have relied heavily on local fish populations for generations. However the demands and restrictions imposed by MPAs can at times prove difficult for small communities. MPA managers hoping to win stakeholder support will have to account for cultural divergences and local attitudes. Communities that have a long history of coastal living may have developed religious or spiritual connotations to the site. For example, a conglomerate of different languages, customs, and cultures share a common fishing area in the Mediterranean.[50] In order to avoid resistance and hostility in the enforcement procedures of MPA law, all communities must feel accounted for. For example, tourism can serve an MPA community well economically, but if companies end up exploiting the local culture they are likely to face some consequences. Some claim that preservation of the biological and ecological value must be the MPA's top priority, but most local indigenous residents would argue that their social and cultural connection to the area is the most important thing to preserve.[51]

[48] "Glossary." National Marine Protected Areas Center: U.S. Department of Commerce. National Oceanic and At…
[49] "Marine Protected Area." AbsoluteAstronomy. 2011. < http://www.absoluteastronomy.com/ topics /MarinePro…
[50] Badalementi, F., A.A. Ramos, E. Voultsiadou, J.L. Sanchez Lizaso, G. D'Anna, C. Pipitone, J. Mas, J.A. Ruiz…
[51] Ibid.

Without recognition of stakeholders, like commercial and local fisheries, recreational fishermen, and governing bodies (both local and international), economic gains will continue to motivate crimes against marine ecosystems. As a result, our policy includes assessment of stakeholders on the basis of their individual, cultural, social, political, and economic motivations. It is important to keep community locals involved in the process and learn from their TEK.[52] Only with that knowledge can we tailor incentives to the various stakeholders and provide them with personal investments in the implementation of policies; policies which are meant to enhance enforcement procedures and expand existing MPAs. Stakeholders vary, just as policies must, depending on the distinct area of an MPA, but their roles and general motivations show much overlap.

[52] Ellen, R. F., Peter Parkes, and Alan Bicker. 2000.*Indigenous environmental knowledge and its transformations: critical anthropological perspectives*. Amsterdam: Harwood Academic.

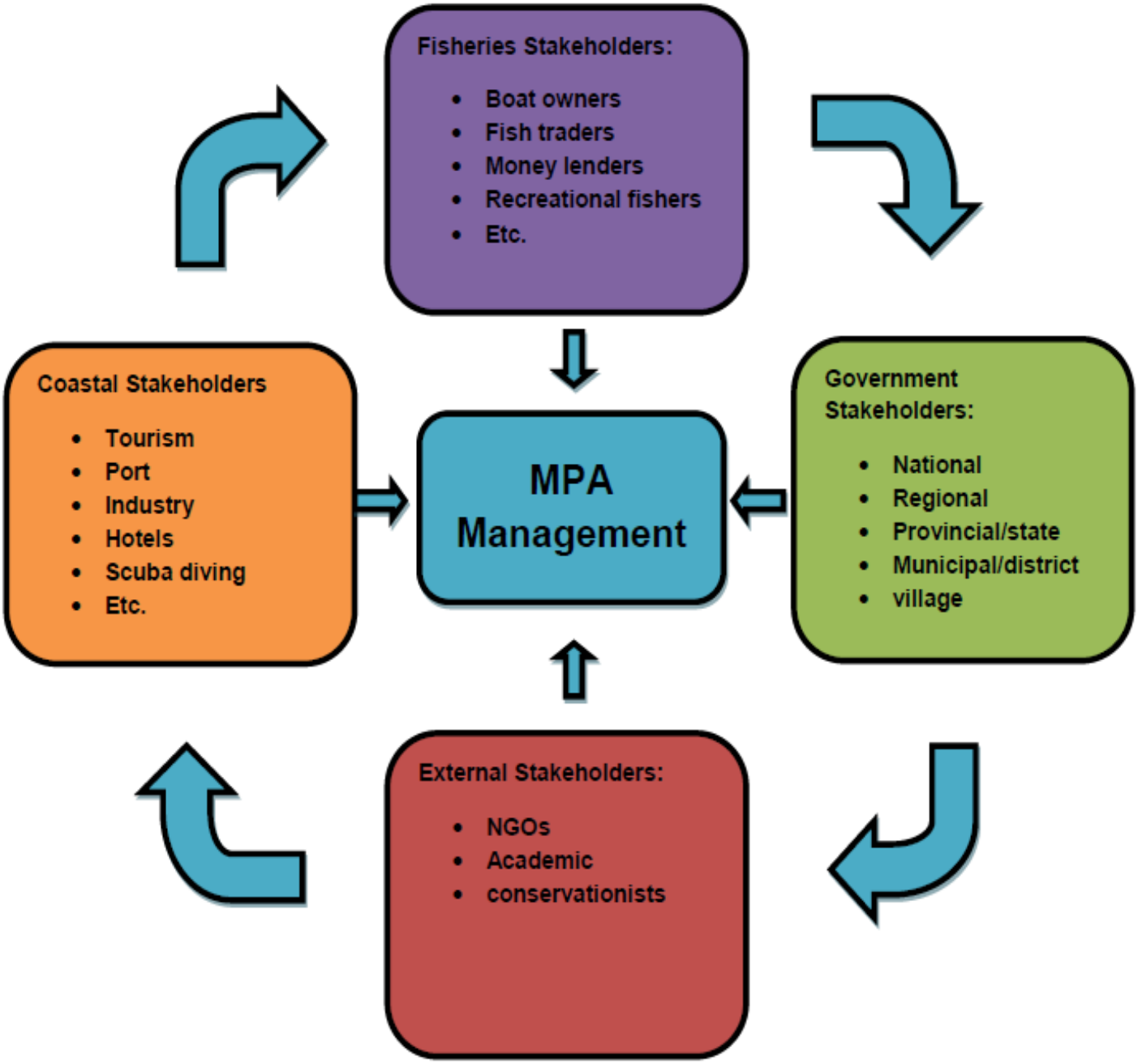

Figure 7: Stakeholder Flow Chart – *Kenna Pearson*

*Created based on the existing charts of Pomeroy, R. S., and Rebecca Rivera-Guieb. 2005. *Fishery co-management a practical handbook.* Wallingford, Oxfordshire [England]: CABI Pub. http://site.ebrary.com/id/10119722 & Nguyen Hai An, "Assessment of MPA management*: Using Analytic Hierarchy Process to analyze stakeholder preferences for performance indicators in Nha Trang Bay MPA, Vietnam*" (PhD diss, Master Thesis in Fisheries and Aquaculture Management and Economics, The Norwegian College of Fishery Science, University of Tromso, Norway & Nha Trang University, Vietnam).

Group of Stakeholder	Related to MPA
Commercial fishermen	Often specially licensed, this group makes their life at sea
Recreational fishermen	This group is fishers but not occupationally; sometimes requires their catch for sustenance and compete for similar species as the commercial vessel
Local household	Households within the local communities in the close vicinity of the MPA area
Local landowner	People who live on the land adjacent to an MPA and gain economic and personal benefit from its well-being
Occupational users of an area (i.e. dive operators, tour guides)	Tour guides earn benefits from preservation of pristine habitat, with ecosystem health being a main tourist draw
Tourist	Tourists gain personal benefit from visiting protected areas; this benefit can be assessed by proxies such as their travel cost or by opinion or survey
Government agencies or manager	Government agencies sometimes behave as a separate stakeholder group. Managers who are responsible for the development and implementation of management plans
Students and universities	Both students and professors can gain knowledge and understanding from the study of MPA
Conservationist	This groups concerned about the environmental impacts of fishing
Non-profits and NGO	These groups work along with local organizations and agencies to protect habitat across the world by providing solutions to local problems

Figure 8: Table of Stakeholder Roles – *Kenna Pearson*[53]

[53] Nguyen Hai An, "Assessment of MPA management*: Using Analytic Hierarchy Process to analyze stakeholder preferences for performance indicators in Nha Trang Bay MPA, Vietnam*" (PhD diss, Master Thesis in Fisheries…

Cross-Regional MPAs

This category of MPAs encompasses a variety of large-scale MPAs facing challenging external pressures, including large commercial fishers moving from zone to zone with the potential to wipe out local stocks. Some of these MPAs exist within EEZs, falling under the jurisdiction of one nation's law, while others span the EEZ of multiple countries and require cross-regional management. In cross-regional cases it can be very difficult to effectively enforce without governing bodies working together through treaties and agreements. The body of RFMOs is unique in that it can serve cross-regional management purposes and also often encompasses areas of the high seas. RFMOs serve as examples of both multilateral and bi-lateral treaties.

An example of a cross-regional area is the EEZ shared by Tanzania and Zanzibar. Tanzania and Zanzibar's concerns about the extreme degradation of their marine environment led to a joint policy called MPRU in 1994, under the Ministry of Natural Resource and Tourism.[54] Important ecosystems in this area include coral reefs, mangroves, estuaries, and seagrass beds. Fishing practices in the region are typically small scale and rely primarily on traps, drag nets, spears, handlines, and seine nets. The most destructive fisheries use such techniques as dynamite fishing, drag and seine netting, and trawling.[55] To manage these threats, MPRU has a mandate to establish and ensure sustainable conservation for areas of outstanding marine ecological importance and manages them in partnership with coastal communities and other stakeholders on mainland Tanzania. Tanzania has also signed on to many international agreements, like UNCLOS and CITES, in an effort to regain control over its resources;

[54] Flora Akwilap, *A Comparative Study on Marine Protected Areas between Australia and Tanzania*. United Nations – The Nippon Foundation Fellow January 200…
[55] Jiddawi, Narriman S., and Marcus C. hman. 2002. "Marine Fisheries in Tanzania". *AMBIO: A Journal of the Human Environment.* 31 (7): 518-527.

demonstrating in many cases that a nation may need the assistance of a trans-regional or transnational partner in order to enforce MPAs spanning multiple EEZs.[56]

Cross-regional MPAs face the challenges inherent in communication and coordination between countries and groups, especially those with competing objectives. These areas clearly encompass a large geographical expanse of sea. Many different migratory species travel in and out of these MPAs, paying no attention to man's imaginary lines, and make it even more difficult for management groups to track the ecological processes occurring within their legal space. This puts more pressure on groups to cooperate with one another and share information across regions.

International High Seas MPAs

High seas MPAs are defined as the area outside the 200-mile EEZs and continental shelf areas, or other described national jurisdictions.[57] Sixty-four percent of the oceans are located beyond the limits of national jurisdiction and are under increasing human threat. MPAs in the deep-sea may seek to protect habitats like seamounts, cold-water corals, hydrothermal vents, open pelagials, deep-sea trenches, cold seep and pockmarks, and submarine canyons.[58] These are the least known and least protected areas on Earth with a variety of their own unique threats. Limited by scarce and expensive resources for their monitoring, high seas ecosystems remain poorly understood and under represented.

The impact of fishing activities on marine environments is one of the main reasons for the establishment of MPAs on the high seas. The impacts of overfishing activities are most noticeable in fisheries of deepwater demersal species, which increases concern of the

[56] Flora Akwilap, *A Comparative Study on Marine Protected Areas between Australia and Tanzania*. United Nations – The Nippon Foundation Fellow January 200…
[57] Cheung, William W. L. 2005. *Patterns of species richness in the high seas*. Montreal, Quebec, Canada: Secretariat of the Convention on Biological Diversity.
[58] Ibid.

management of these deepwater fishery resources and their ecosystems.[59] Because high seas MPAs are beyond national jurisdiction, they require collaboration on the part of both international and national governance, presenting a unique management challenge. For example, the cod off Canada's eastern coast and the Pollack in the Bering Sea are highly migratory species, moving between EEZs and the high seas.[60] Fishermen in coastal areas believe that diminishing catches are due to increased commercial fishing in the high seas range. The resulting conflict between nations encouraged participation from the governing bodies of fishing nations, international committees like the UN, and large commercial fishing vessels. In the efforts to incite regulations in high seas MPAs, it is pertinent to asses these new stakeholder attitudes, their leverage, motivation, and strategies.

UNCLOS currently serves as a multilateral agreement applicable to situations on the high seas, but it has not achieved global buy-in and has no power over non-signatory nations or their vessels. The Boulogne-sur-Mer international seminar was held in September of 2011 in Paris, France with the goal of developing a legal framework for the creation and management of cross-regional MPAs in areas beyond national jurisdiction. Regional legal frameworks, the Law of the Sea Convention, and the Biodiversity Convention were all highlighted as potential avenues for further exploration.[61] A number of regional initiatives already exist for the implementation of high seas MPAs. For example, the NEAFC includes specific area closures to bottom trawling and other static gear fishing in order to protect juvenile fish and cold-water corals. Further, fisheries using gillnets, entangling nets, and trammel nets are prohibited below 200 meters. NEAFC has 355,300 square km. closed to fishing and 655,000 square km. open south of

[59] "Marine Protected Areas in the High Seas." Fisheries and Aquaculture Department. FAO: 2012…
[60] Development and Human Rights Section Department of Public Information. "The Agreement on High Seas Fishing." United Nations: It's Your World. N.p., n.d. Web. 27 Jan. 2012. <http://www.un.org/ecosocdev/geninfo/s>.
[61] Druel, E., Billé, R., Treyer, S. *A legal scenario analysis for marine protected areas in areas beyond national jurisdiction.* Boulogne-sur-Mer seminar, 19-21 September 2011, Studies N°06/11, IDDRI – IUCN – Agence des…

Ireland.[62] These existing MPAs are one of the few tools in place today for addressing the activities of large-scale regions and their vastly complicated ecosystems.

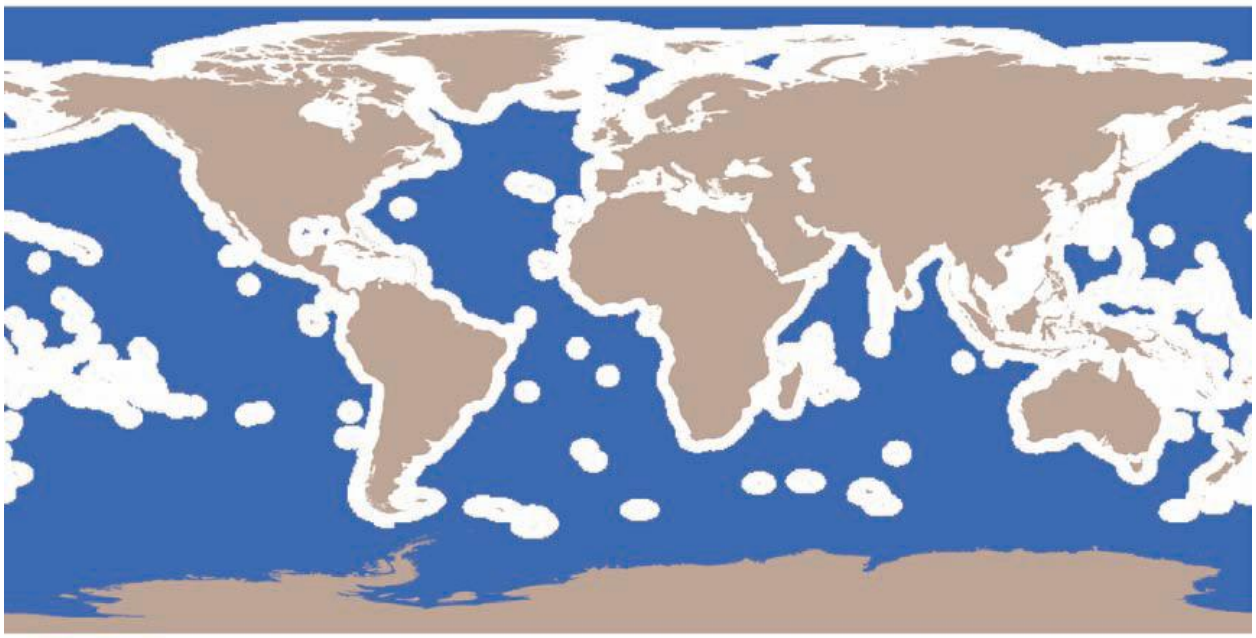

Figure 9: High seas marine areas are located outside national EEZs and are represented here in blue. This covers approximately 202 million km2, as opposed to 363 million km2 for the World Ocean.[63]

Policy Roadmap

In the next chapter of this policy report, we will review the legal frameworks relevant to our three categories of MPAs (community-based MPAs, cross-regional MPAs, and international high seas MPAs) and offer solutions for improving legislation and agreements in each MPA category. We will then address the challenges of monitoring MPAs and propose solutions for

[62] "Marine Protected Areas in the High Seas." Fisheries and Aquaculture Department. FAO: 2012. < http://www.fao.org/fishery/topic/16204/en>.
[63] Cheung, William W. L. 2005. *Patterns of species richness in the high seas*. Montreal, Quebec, Canada: Secretariat of the Convention on Biological Diversity.

surveillance in our three MPA categories. Finally, we will review alternative funding methods to support a stronger MPA network and present comprehensive policy solutions for community-based MPAs, cross-regional MPAs, and international high seas MPAs. We will conclude with a "Decision Tree" of sorts that comprehensively presents all of these recommendations.

Chapter 2: Legal Frameworks

Gee Lee, Carolyn Gilbert, Kevin Rowland, and Brittany Cook

Chapter Summary

Key Policy Considerations

The policy objective is to augment international legal guidelines that can support the protection and enforcement of MPAs in developing countries. These legal proposals are aimed at three functional levels: supra- and international, national, and community. By strengthening the legal structures at all three levels, it provides the mechanism for developing countries to effectively enforce MPA laws.

Background

The key policy issue surrounding the three types of MPAs (International, Cross-Regional, and Community-Based) are simultaneously diverse and interrelated. On one hand, there are gaps in international jurisdiction regarding waters outside of EEZs. On the other hand, this gap also exists in local communities, where national law cannot be effectively implemented. Ultimately, individual States have the exclusive right to exploit fisheries, but they also have the exclusive authority to protect them. What is needed is a strengthened legal system at all levels; a legal backbone that can begin to close these jurisdictional gaps and support the necessary institutional changes in enforcement.

Policy Considerations

International law is based on consensualism. This creates a two-fold problem: there needs to be an incentive to sign onto the document, and there needs to be an incentive for mutual enforcement on behalf of the State parties involved. More specifically, effective enforcement for

MPAs requires a strong legal framework at both the point of catch and the sale of fish in protected areas. An effective legal structure can support enforcement on both sides.

Policy Recommendations

Point of Catch:

- Include text on asset forfeiture in the UNCLOS (including requirements regarding international coordination and funding delegation).
- Include text authorizing international cooperation in the monitoring and enforcement of international MPAs into UNCLOS.

Point of Sale:

- Modify CITES Appendix 2 to regulate import control in addition to export control, add depleted commercial fish species to Appendix 2 of CITES treaty.
- All fishery products should be labeled and certified at point of sale.

Community-level MPAs:

- Solidify property rights and conservation legislation in developing nations.
- Encourage community-based MPAs to define clear community goals and rules where feedback can facilitate shaping and improving rules.

Introduction

This Task Force has chosen to divide MPAs into three categories: International (High Seas), Cross-Regional and Community. However, when discussing strengthening legal frameworks, especially on the international level, breaking down policy recommendations and discussion into these three categories fails to address the complexity of the issues at hand. We will begin by discussing some of the existing legal structure in cross-regional and international MPA management schemes, which serves as a foundation for the material to come. We have decided to divide the discussion amongst particular legal issues: establishing flag-state jurisdiction, fortifying legal tools such as asset forfeiture, certification and eco-labeling programs, and property rights. Each of the sections addresses the three MPA categories within its own legal context.

Existing Legal Structure

Brittany Cook and Kevin Rowland

Statutory Law in Cross-Regional and International High Seas MPAs

Regional Management Approaches

Global conventions and agreements often serve as a foundation for regional legislation around MPA management. UNCLOS mandated RFBs, for example, manage over 50 percent of the world's valuable fish stocks, either by region or particular species. RFMOs also operate in consistency with UNCLOS. The RFMOs in existence today vary greatly in their mandates, legal authorities, membership, and geographical coverage, but they are designated to manage a particular area of the ocean and have the power to implement gear restrictions and area closures on the sites that they enforce. Examples include the NAFO, the NEAFC, and the CCAMLR. The

flag State nations that fish in these regions have signed binding treaties with each other to form these RMFOs, which are led by a secretariat that rotates from country to country. RFMOs set up restrictions and quotas for fishing, monitor fishing vessels, and provide a binding international legal framework for nation states to punish violators through a system called 'port-state control.' Fishing vessels from countries that have signed the treaty must prove to their flag State that their catch is legal to offload in any contracted or cooperating state (port-state). If their catch is illegal, the fishing vessel cannot unload its fish. The flag State can then impose fines on the fishing vessel, strip the fishing vessel's license to fish in RFMO waters, or pursue criminal charges against the owners of the fishing vessel in accordance with its national laws. Due to high seas freedoms in UNCLOS, RFMOs are, however, limited in their ability to regulate IUU fishing from non-contracting nations. The RFMO system is to simply deny access of these fishing vessels to their ports, and to notify the flag State of the fishing vessel's behavior. They post lists of IUU fishing vessels online.[64]

In the case of highly migratory fish, RFMOs are inadequate because they don't cover total species range. Highly migratory fisheries are therefore managed by species-based regional fishing bodies. These fishing bodies often overlap with RFMOs, but only manage highly migratory species take. Such fishing bodies work similarly to RFMOs. A treaty binds those States fishing these particular species, and species-based RFBs set up quota, gear, and location restrictions for the species fished. These RFBs monitor the boats fishing, and provide an international legal framework for contracting states to punish rule violators. RFBs exist for cetaceans, tuna, and andramodous fish (salmon). Species based RFBs, due to UNCLOS mandated freedom of the seas, have no way of enforcing their regulations on non-contracting

[64] CCLMAR <http://www.ccamlr.org/pu/e/sc/fish-monit/IUU-Vessel-List-Dec-2011.pdf>, NEAFC <http://www.neafc.org/illegalfishing>, NAFO <http://www.nafo.int/fisheries/frames/fishery.html>.

boats. These species based RFBs have to resort to the same methods as RFMOs, namely, notifying the flag state of its fishing vessel's activities and denying the offending boat access to contracting state ports. Clearly not all fishing vessels choose to comply and oftentimes will register in another state that is not a member of the RFMO in order to avoid its laws, so that both member and non-member vessels are engaging in IUU fishing. The strength in RFMOs lies in their legitimacy in member numbers. RFMOs appear to be creating a level playing field for the action of international fisheries, and they lend legitimacy to other measures deemed controversial if applied unilaterally.[65] The FAO states a list of legal guidelines for RFMOs in preventing, deterring, and hopefully eliminating IUU fishing:

- collect and disseminate information relating to IUU fishing
- identify vessels that are engaging in IUU fishing and coordinate measures against them
- identify States whose vessels are engaging in IUU fishing and can urge identified States to rectify such behavior
- call on their members to take action against vessels without nationality that are fishing in the relevant region
- adopt rules to ensure that vessel chartering arrangements do not lead to IUU fishing
- adopt port inspection schemes, restrictions on transshipment at sea and schemes creating a presumption that fish harvested by non-member vessels in the relevant region should not be permitted to be landed in ports of members
- adopt catch certification and/or trade documentation schemes
- adopt other market-related measures to combat IUU fishing[66]

RFMOs have additional powers over compliance and many are still working on improving their monitoring, control, and surveillance activities. The IPOA-IUU encourages developing real time catch and vessel monitoring systems, other new technologies, monitoring of landings, port control, and inspections and regulation of transshipment, as appropriate.[67] But in order to succeed, states will have to coordinate their activities with RFMOs to an even greater extent.

[65] Ibid.
[66] Ibid.
[67] Ibid.

There are a number of other challenges facing RFMOs and their members, including the increasing amount of paperwork via certification and documentation schemes which places a burden on legitimate fishers, ensuring that vessels do not take part in flag hopping (aka gaining access to more than one member's quota), the hindering speed and scope of the exchange of information on IUU fishing, and flag states whose vessels continue to ignore their international commitments. The NPAFC currently serves as a good model of cooperation and communication efforts between regional organization and government, coordinating closely in their action against vessels that may be fishing for salmon or other anadromous stocks on the high seas of the North Pacific.[68] Cooperation and participation among states is key to the success of RFMOs.

Since regional agreements and regional oceans management organizations cannot bind other states outside their agreement or members of other international organizations, regional organizations have initiated "collective arrangements" that build upon bilateral communication and understandings between regional and global groups.[69] Progress can vary considerably depending on the region, however, based on factors such as access to resources. Existing players often stem from different ministries and have difficulties agreeing on rules around the design and management processes, as well as making decisions around conservation issues. With such a diversity of actors, states may not necessarily be party to all of the relevant agreements and therefore can only be expected to implement the measures in the framework to which they are privy.[70] Whether or not regional agreements and RFMOs provide the *best* legal framework for the continued protection of MPAs is debatable, but they do provide stakeholders of the intergovernmental processes with a basis for facilitating exchanges and determining which strategies are best suited to address their situation.

[68] Ibid.
[69] Druel, E., Billé, R., Treyer, S. *A legal scenario analysis for marine protected areas in areas beyond national…*
[70] Ibid.

MPA Networks

MPA networks serve as another essential tool to aid in the protection of ocean biodiversity. The OSPAR Recommendation, for example, works in conjunction with Biodiversity Strategy and the Helsinki Convention (HELCOM) to form the basis for a coherent network of well-managed MPAs.[71] MPA networks are a feasible solution to the problem of highly migratory species and take into account the links to processes occurring outside the boundary of a single MPA working alone. Most national MPA networks currently in planning cover a range of MPAs, including no-take zones and multiple use sites. Some countries' MPAs are a part of a broad conservation plan to develop a national protected area system, like those of Belize, Cuba, and Mexico, while others like South Africa, Tanzania, Rodrigues (Mauritius), the U.S., and Canada have MPA networks that are separate from the process that establishes terrestrial protected areas. The Mesoamerican Barrier Reef in Belize demonstrates how a national MPA network can encompass both a national coastal management plan and a regional one, and also incorporates international protected area designations like the World Heritage Site.[72] Unfortunately, few, if any, countries actually have adequate MPA networks, though some are at least starting to make progress towards planning for protection of their territorial waters and EEZs. The main issue from the outset is whether the network's responsibility will be focused around biodiversity protection or resource management for human use, like fisheries.[73] It is important for individual MPAs to work together so that overarching goals can be achieved, but a fully functioning MPA network does not necessarily have to be managed in the exact same way

[71] *High Seas MPAs : Regional Approaches and Experiences.* United Nations Environment Programme. 12th Globa…
[72] "National and Regional Networks of Marine Protected Areas: A Review of Progress." UNEP World Conservation Monitoring Center. UNEP-WCMC Biodiversity Series No. 30. November 2008. < http://www.une...
[73] Ibid.

across sites. MPA networks have demonstrated success under government management, co-management, private, and community management.

With all this in mind, it is critical to ensure that MPA networks do not result in the creation of more unmanaged paper parks; evaluations and assessment of management should be completed regularly.[74] The OSPAR MPA network requires a site present its management guidelines and how it intends to achieve its conservation aims. Background documents and scorecards are used to assist in the design process.[75] UNEP-WCMC lists some of the benefits of MPA networks as the following:

- Ensuring the protection of an ecosystem or species that cannot be adequately protected in one country, such as migratory species
- Ensuring that transboundary protected areas are given adequate attention
- Sharing effective conservation approaches across similar sites in different regions;
- Developing collaboration between neighboring countries to address common challenges and issues
- Strengthening capacity by sharing experiences and lessons learned, new technologies and management strategies, and by increasing access to relevant information[76]

MPA networks demonstrate another approach to addressing the issues associated with global marine ecosystems. Countless other legal frameworks and agreements exist today in concerted efforts to better protect established MPAs, and as more MPAs are created over time, hopefully these existing frameworks will be able to adapt and evolve to appropriately tackle pressing concerns.

[74] Ibid.
[75] *High Seas MPAs : Regional Approaches and Experiences.* United Nations Environment Programme. 12th Global Meeting of the Regional Seas Conventions and Action Plans. Bergen, Norway, 20th-22nd Sept. 2010…
[76] Ibid.

International Legal Documents and Flag-State Jurisdiction

Kevin Rowland

Ninety percent of the world's marine fisheries lie within single state jurisdictions.[77] The remaining ten percent of commercially exploited marine species, however, have ranges that spill over domestic waters into the high seas, other domestically controlled waters, or both. Three types of commercial fisheries spill over domestic waters: shared stock fisheries, straddling stock fisheries, and highly migratory species fisheries. Highly migratory species, tuna, sharks, and cetaceans (dolphins, porpoises, and whales)[78] migrate extensively and often unpredictably through high seas and domestic waters. Straddling fish stocks, like the Patagonian Toothfish, move between one or more countries' EEZs and the high seas. Shared stocks, like the anchovy fishery in Peru, exist in two or more coastal state EEZs. Many benthic and benthopelagic fisheries are also located in the high seas, like the Orange Roughy fishery. Nations attempting to establish MPAs in these fisheries need an international legal framework to protect these areas because oceanic ecosystems stretch across national boundaries.

All fish stocks would benefit from the implementation of MPA networks that were selected based on scientific data, whether lying between sovereign state's EEZs or in the high seas. The 2002 World Summit on Sustainable Development (WSSD), in its 'Plan of Implementation,' states that contracting parties should "[d]evelop and facilitate the use of diverse approaches and tools, including the ecosystem approach, the elimination of destructive fishing practices, the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012 and time/area closures for

[77] FAO Code of Conduct for Responsible Fisheries, Introduction.
[78] Much of the migratory routes of highly migratory species remains unknown, highlighting the need for international conservation measures. Check out TOPP, the Tagging of Pacific Predators Project http://topp.org/ to learn more about this research. One tagged Bluefin Tuna traveled over 45,000 miles in just under 3 years.

the protection of nursery grounds and periods…"[79] It is now 2012 and the goal of having representative networks of MPAs 'by 2012' has not been implemented. While discussing the current international legal structure in regards to protecting MPAs, this chapter also suggests ways that it could be approved. By creating a better international legal model, new MPAs could be protected underneath modified existing international law.

The UNCLOS, held in 1982, enacted an overarching international legal framework for all activity in the world's oceans. Considered by many to be a 'constitution of the oceans,'[80] its stipulations are almost universally followed by countries that have ratified the treaty, as well as by countries that have not ratified the treaty.[81] This current international legal framework mandates that nations cooperate in order to conserve resources in the EEZ and in the high seas, but does not explicitly provide a framework for the establishment, monitoring, and enforcement of MPAs outside of national jurisdiction. Legal precedent for MPAs must be drawn from a list of multilateral treaties and conventions written before the widespread implementation of MPAs as a marine conservation strategy. Due to the ecological and economic realities of modern industrial fishing fleets, as well as the substantial scientific evidence proclaiming the efficacy of MPAs in protecting marine resources, much work has already been done to codify and synthesize these legal treaties into a functional legal backbone for the implementation and protection of MPAs. The work so far, however, is still in its infancy. As the environmental lawyer Christoph Schwarte states, "[t]here is…no global legal framework which defines international responsibilities and

[79] WWSD-POI Chapter 4 pg. 32.c
[80] "A Constitution for the Oceans" Remarks by Tommy T.B. Koh, of Singapore. President of the Third United Nations Conference on the Law of the Sea…
[81] Although the United States hasn't ratified the UNCLOS treaty, it follows UNCLOS rules and treats UNCLOS as customary law in international waters.

mechanisms in the identification, creation and protection of MPAs"[82] Even so, other global legal frameworks, specifically those concerning flag-State control, asset forfeiture, eco-labeling, and international trade, can provide international legal protection for MPAs both in EEZs and the high seas.

UNCLOS is the main legal structure that delegates the duty to conserve the environment to the coastal nation within an EEZ. Within the EEZ the coastal state has the exclusive right to fish, as well as the sole responsibility of managing and conserving its fishing grounds. Article 56 of UNCLOS says states have "sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living…"[83] within their EEZ. The coastal state has the *exclusive* right to exploit the fish, but also the *exclusive* duty to conserve and manage the fishery where those fish live. Sovereign nations that have the political willpower and resources can protect their EEZ and territorial waters from internal and foreign overfishing. Sovereign nations without the resources and/or the political willpower, on the other hand, may want to protect their EEZ and territorial waters, but lack the funding for monitoring and enforcement mechanisms or the institutional structures to do so. In weak states, MPA monitoring and enforcement often breaks down, resulting in paper parks. The current international legal system allows internal and foreign overfishing in weak state coastal waters.

UNCLOS mandates that on the high seas, States have "the duty to take, or to cooperate with other states in taking, such measures for their respective nationals as may be necessary for the conservation of living resources of the high seas."[84] States are supposed to cooperate to conserve the living resources of the high seas. Specifically, these States "shall, as appropriate,

[82] Schwarte, Christoph, and Linda Siegele. 2008. *Marine Protected Areas on the High Seas?: An introductory guide to the legal issues surrounding the establishment of marine protected areas on the high seas*. United Kingdom…
[83] UNCLOS Article 56
[84] UNCLOS Article 117

cooperate to establish sub-regional or regional fisheries organizations to that end."[85] These organizations are supposed to be in control of managing high seas fisheries, but cannot monitor or enforce fishing vessels that are not party to the regional organization's agreements. Nations that are not party to the agreement have the right to fish in the high seas, and cannot be stopped by RFMO enforcement vessels according to UNCLOS.

This UNCLOS enforcement regime has led to many problems with high seas fishery enforcement. UN paper Agenda 21 claims that in high seas fisheries, "[t]here are problems of unregulated fishing, overcapitalization, and excessive fleet size, vessel reflagging to escape controls, insufficiently selective gear, unreliable databases and lack of sufficient cooperation between states."[86] It goes on to say that states that are fishing in the high seas "should address inadequacies in fishing practices, as well as in biological knowledge, fisheries statistics, and improvement of systems for handling data"[87] Clearly, much needs to be done to augment UNCLOS high seas and EEZ laws to create better fisheries management.

Modify UNCLOS Flag-State Control

'Flag-State Control' is the backbone of UNCLOS high seas law. In the high seas, states can enforce fishing rules and regulations on boats registered in their state, but cannot enforce fishing rules and regulations on boats registered in another state. The flag-States are supposed to cooperate to conserve the environment: UNCLOS says that, "[a]ll states have the duty to take, or to cooperate with other States in taking such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas,"[88] but the monitoring of

[85] UNCLOS Article 118
[86] Agenda 21 17.45
[87] Ibid
[88] UNCLOS Article 117 "Duty of States to adopt with respect to their nationals measures for the conservation of the

those conservation efforts and their enforcement lies with 'flag States,' states that license the fishing boats. UNCLOS states,

> Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in this Convention, shall be subject to its exclusive jurisdiction on the high seas.[89]

It follows that, with the very important exception of binding international treaties, fishing vessels can only be regulated by their own state. If states do not sign treaties, they are solely responsible for regulating their fishing boats. Since the high seas cover all areas over 200 nautical miles from the coast of any nation, 64 percent of the world's oceans are unprotected by international law from the unmanaged fishing of States that have not signed high seas fishing treaties, and lack the political willpower or resources to manage their fishing fleets themselves. This system of 'flag-State control' works on the high seas around the developed world, where states have the resources and political will to regulate their high seas fishing fleets, but needs to be modified to protect developing world fisheries from abuse.

IUU fishing continues to be a problem, as boats not genuinely from third-party nations fly 'flags of convenience,' the flag of a weak state that can't or won't regulate fishing. When a high seas fishing vessel gets its license stripped due to illegal fishing by its flag State, the company often immediately re-registers that vessel in another state with less stringent controls. This process, called 'vessel reflagging,' is a ubiquitous problem. The examination of IUU fishing lists posted online by RFMOs reveals that most, if not all, IUU fishing boats have been reflagged at least once. A UNCLOS international regulatory regime that allows fishing companies to

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living resources of the high seas"
[89] UNCLOS Article 92

register their vessels in any state they choose, and reflag those vessels when the state strips them of their license, has allowed IUU fishing to flourish.

In 1993, the UN ratified the FAO Compliance treaty to try and stop fishing companies from being able to register their ships underneath 'flags of convenience' and participating in 'vessel reflagging.' This treaty emphasizes the responsibility of flag States to regulate their high seas fishing vessels; to ensure that the vessels concerned do not undermine the effectiveness of international conservation and management measures.[90] The agreement says, "No party shall authorize any fishing vessel entitled to fly its flag to be used for fishing on the high seas unless the Party is satisfied that it is able…to exercise effectively its responsibilities under this Agreement in respect of that vessel."[91] It continues on to say that, "[n]o party shall authorize any fishing vessel previously registered in the territory of another Party that has undermined the effectiveness of international conservation and management measures to be used for fishing on the high seas…"[92] This agreement came into force in 2003 and makes it much more difficult for fishing companies operating underneath nations that are party to the agreement to fly flags of convenience or reflag their vessels.

The Fish Stocks Agreement is meant to complement the FAO Compliance agreement, clarifying that states party to an RFMO have the jurisdiction to enforce conservation measures on vessels from states party to UNCLOS and the Fish Stocks Agreement, regardless of whether the offending vessel's flag State is party to the RFMO itself. [93] This 'surrogate enforcement' clause

[90] 'Fao Compliance Agreement' Accessed Feb 16 2012. http://www.fao.org/fishery/topic/14766/en
[91] FAO Compliance Agreeement Article 3.3
[92] FAO Compliance Agreement Article 3.5
[93] "In any high seas area covered by a subregional or regional fisheries management organization or arrangement, a state party which is a member of such organization or a participant in such arrangement may, through its duly authorized inspectors, board and inspect…fishing vessels flying the flag of another State Party to this agreement, *whether or not such State Party is also member of the organization or a participant in this agreement,* for the

gives the power to RFMO states to enforce conservation measures on all high-seas fishing boats party to the Fish Stocks and RFMO agreements, and provides adequate international legal structure for the protection of MPAs on the high seas. The FAO Compliance Agreement and the UN Fish Stocks agreement, unfortunately, do not have widespread acceptance or compliance in the international community; only 59 nations have signed the fish stocks agreement,[94] and only 39 have signed the FAO Compliance Agreement. [95] Clearly, although the international legal structure is in place to provide a solid foundation for the monitoring of MPAs in the high seas the problem remains that most states do not have the political will or political interest to do so.

To help protect high seas MPAs, the United States government needs to sign onto the UNCLOS treaty. After the United States signs the UNCLOS treaty, the US government should make a formal request at the annual UNCLOS conference of the parties to include the fish stocks 'surrogate enforcement' clause in UNCLOS law. Since UNCLOS has far greater international acceptance than the Fish Stocks Agreeement, many more states will agree to a modified UNCLOS treaty.

CITES: Convention on International Trade in Endangered Species

Despite improvements, international marine law remains primarily based on consensualism. If all parties that fished on the high seas signed the Fish Stocks and FAO Compliance Agreements, for example, and acted according to their regulations, IUU fishing would be greatly curtailed. Unfortunately, as previously mentioned, very few nations have

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purpose of ensuring compliance and management measures for straddling fish stocks and highly migratory fish stocks established by that organization or agreement" Article 21, UN Fish Stocks Agreement

[94] Maritime Space: Maritime Zones and Maritime Delimitation http://www.un.org/depts/los/LEGISLATIONANDTREATIES/status.htm Updated Jan 8 2010 Accessed Feb 15 2012

[95] Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. www.fao.org/legal/treaties/012s-e.htm

signed the Fish Stocks and FAO Compliance agreements, limiting their effectiveness in closing UNCLOS loopholes that IUU fishing boats exploit. Unlike the Fish Stocks and FAO Compliance agreements, the CITES agreement is a treaty with wide participation and enforcement mechanisms that has proven its effectiveness in protecting commercially viable terrestrial plants and animals by regulating their international trade. It is one of the most widely accepted treaties with over 167 signatories. Although the CITES agreement has never protected a commercially viable fish species, there is no reason why it could not be used to protect many of the highly migratory species that FAO Compliance agreement and the Fish Stocks Agreement have failed to protect. Due to its trade-based approach to limiting IUU fishing, and its wide acceptance by the international community, there is also reason to hope that a more widespread use of the CITES agreement in international waters would yield better results than the current conservation regime.

How CITES Works

CITES regulates the international trade in endangered species through a permit structure that organizes species under three levels of conservation priority. International trade in Appendix 1 species, species threatened with extinction, is permitted only in exceptional circumstances for non-commercial purposes. Trade in Appendix 1 species requires both an export and import permit, both of which can only be issued if the importer and the exporter prove that the species was legally obtained and that the trade is not detrimental to the survival of the species. Trade in Appendix 2 species, species not necessarily threatened with extinction, but whose utilization must be controlled, only requires an export permit. Appendix 2 species can be traded for commercial purposes but only if the exporter can prove that the species was legally obtained and that the export will not be detrimental to the survival of the species. Trade in both Appendix 1

and 2 species require scientific evidence that the survival of the species will not be damaged by the trade. Trade in Appendix 3 species requires an export permit that proves that the species was captured legally, but does not require scientific input about the health of that species in its home environment. Species of concern are proposed for listing by a Party and then discussed and put to a vote at the biennial meeting of the Conference of the parties.

Current Reality/How CITES is Used Today

There are a number of examples of the CITES treaty being used to effectively limit the illegal trade of multiple terrestrial species. Over 30,000 species of animals and plants have been listed in appendices 1-3 of the CITES treaty, ranging from large mammals such as tigers and elephants, to native plant species that include much diversity, such as tropical hardwoods and orchids. The broad success of this treaty is evidenced in the fact that no species listed underneath the CITES convention have gone extinct over the last thirty years of its implementation.[96]

Due to the success of CITES in protecting commercially viable terrestrial species, many states have attempted to protect commercially viable marine species with the convention. In recent years, conservation groups such as the World Wildlife Federation have lobbied heavily to protect the Atlantic Bluefin Tuna, sharks, and Patagonian Toothfish underneath the CITES agreement. Unfortunately for these species, they hold a high commercial value, and as of yet, none of these fish species have been protected underneath CITES. States that benefit most from their trade have argued that the management of these fisheries is better handled by other conservation organizations, rather than by the international convention. Those states are able to hold this argument due to the nature of CITES appendices 1 and 2 classifications. CITES makes it illegal to sell Appendix 1 species commercially, and also has import and export controls for

[96] 'Ivory Ban Lifted.' http://news.bbc.co.uk/2/hi/science/nature/276691.stm

any transfer of Appendix 1 species. For Appendix 2 species, CITES allows commercial trade, but only requires export permits. Fishing vessels trading Appendix 2 species would have to have a permit to sell their fish at the first point of sale, proving that their catch was caught legally and that the catch didn't harm the species chances of survival. RFMOs, however, usually regulate the catch at the first point of sale with a similar permitting process called a 'catch documentation scheme.' If CITES Appendix 2 was modified to require import permits for certain species, fisherman could sell the species legally and governments could regulate the trade of that species not just at the first point of sale, but also at the second, third, and fourth point of sale, all the way to the customer's table.

The following three examples show that CITES can protect fish species through the regulation of international trade when fisheries management organizations fail to regulate catch. In this model, RFMOs would regulate the catch of fish, and the first point of sale of the fish. After the first point of sale, a modified CITES agreement would regulate the trade of fish through import and export controls during its entire processing and distribution chain. CITES and RFMOs could work together to protect depleted fisheries, minimizing the weaknesses of both conservation models.

CITES and Atlantic Bluefin Tuna

Atlantic Bluefin Tunas are the most sought after fish for sushi restaurants in Japan, the United States, and the European Union. Atlantic Bluefin Tuna can sell in Japanese sashimi markets for anywhere between 5-17 dollars per kilo.[97] The ICCAT is the RFMO that regulates Bluefin Tuna fishing in the Atlantic Ocean, by setting total allowable catch quotas and fishing

[97] Trond Bjorndal "The East Atlantic Bluefin Tuna Fisheries: Stock Collapse or Recovery?" *Marine Resource Economics.* Vol 21 pp. 193-210. 2006.

seasons based on scientific data from the SCRS, its in-house research organization. ICCAT, however, has consistently ignored the advice of the scientific community, setting total allowable catch quotas far above the numbers recommended by the SCRS and third party scientists.[98] In 2009, SCRS, in response to a decline of the spawning Eastern Atlantic Bluefin Tuna stock, and the ineffectiveness of ICCAT to avoid the likelihood of stock collapse, prepared a report calling for increased conservation measures. It stated the failure of ICCAT to effectively monitor the Eastern Atlantic fishery in 2008, giving a wide range of estimates for the catch taken, 25,760 tons to 68,600 tons, far in excess of its recommended 15,000 tons.[99] It also noted that almost 100 percent of the Atlantic Bluefin Tuna stocks had gone to Japan.[100] It then issued dire predictions about the fish's future. "Even the most optimistic evaluation of the SCRS," concluded that sustainable stock biomass was well below levels needed to achieve maximum sustainable yield, and that overfishing was rampant in the fishery.[101]

ICCAT's 2009 meeting responded to this report by reducing the total allowable catch of the Atlantic Bluefin Tuna fishery to 13,500 tons, and implementing new observer and catch report systems. It also put in place a catch documentation system to track tuna from the point of catch to the first point of sale. Monaco submitted a proposal in October 2009 to include the Atlantic Bluefin Tuna in Appendix 1 of CITES. The proposal says that Atlantic Bluefin, due to their drastic decline in the entirety of their range and strong international market incentives to participate in IUU fishing and illegal trade, qualified for Appendix 1 of CITES. An Appendix 1 designation would have banned international Atlantic Bluefin Tuna trade, and since nearly all

[98] "Mind the Gap: An Analysis of the Mediterranean Bluefin Trade. Oct. 17, 2011in Global Tuna Conservation produced by the Pew Environmental Group. Accessed 2/15/2011. www.pewenvironment.org/news-room/other-resources/mindthegap
[99] Renee Martin-Nagle. "Current Legal Developments: Convention on Trade in Endangered Species (CITES)." *The International Journal of Marine and Coastal Law 25* (2010) 609-620.
[100] Ibid, 613
[101] Ibid, 614

Atlantic Bluefin Tuna are exported, it would have also circumvented the struggling ICCAT body to bring the total allowable catch to zero. During the meeting, a majority of the signatories to CITES agreed that ICCAT was the appropriate forum to manage the fishery and that the recent, more stringent ICCAT rules should be given time to take effect. One of these rules, an electronic Bluefin catch documentation system, went into effect for the 2012 fishing season.[102]

Today, ICCAT continues to struggle to monitor and enforce the Atlantic Bluefin Tuna fishery. This may have gone differently had CITES listed the Atlantic Bluefin Tuna under the proposed modified Appendix 2, as opposed to Appendix 1. That way, the commercial sale of some of the Bluefin Tuna stock would still have been legitimate. Illegal Atlantic Bluefin Tuna trade could have been controlled not just at the first point of sale, but at various distribution and processing points along the way to the customer. Since tuna has a long distribution and processing chain before it is finally consumed, a disruption at any point along that chain would increase costs for the illegal trading network, and serve as a disincentive to illegal fishing.

CITES and Sharks

Shark fins are the main ingredient in shark fin soup, a Chinese delicacy that can cost 100 USD a bowl in fine Chinese restaurants.[103] Although the shark fins can cost 300 dollars a pound,[104] shark meat is relatively inexpensive, and takes up freezer space on high seas fishing boats. Therefore, many fishing vessels process sharks in the ocean, cutting off the fins of the shark and throwing the rest of the carcass, often still living, back into the water. This method of fishing, called 'shark finning' is environmentally unsustainable because of the nearly endless

[102] "ICCAT: Progress, Yes. Success, No" in PRNewswire: PEW Environmental Source. www.prnewswire.com/news-release/iccat-progress-yes-success-no. Assessed 2/17/2-12
[103] Paul Hilton. *Shark Fin Soup and the Conservation Challenge.* Time Magazine. Aug 9, 2010, available at http://www.time.com/time/magazine/article/0,9171,2021071,00.html
[104] Ibid

amount of shark fins that fit into a fishing vessel's freezer. Shark finning has taken a huge toll on the amount of sharks left in the ocean. As many as 73 million sharks are killed annually for their fins.[105] A recent IUCN finding shows that thirty-two of the sixty-four open ocean shark species are in danger of extinction due to overfishing.[106] Despite these numbers, only the great white shark, the whale shark, and the basking shark, and sawfishes are protected underneath Appendix 1 of the CITES treaty. In 2010, CITES rejected applications for the spiny dogfish, three species of hammerhead sharks, and the oceanic whitetip shark, even though these species are both endangered and highly sought after for their meat and fins.

Since there is no global organization to regulate shark fishing, only national laws protect sharks from shark finning boats. While many states have outlawed shark finning, including the United States, these laws are often filled with loopholes and easily circumvented. In the United States, the Shark Finning Prohibition Act of 2000 banned all shark finning in US waters,[107] but did not apply to boats without fishing gear, and based monitoring and enforcement on a fin-to-shark weight ratio. US flag-State boats still legally collect shark fins from other fishing boats on the high seas. They could also fin lots of small sharks, and keep a large shark on board to maintain the correct shark-fin to shark weight ratio. Once again, a modified Appendix 2 CITES regulation of protection of shark species would allow for the sale of shark fins, but drastically reduce their overfishing.

CITES and the Patagonian Toothfish

The Patagonian Toothfish is a large, demersal, predatory fish that lives in the southern

[105] Erik Stokstad. 'Trade Trumps Science for Marine Species at International Meeting' *Science* Apr 2010 vol 328
[106] Press Release, Intl Union for the Conservation of Nature, 'Third of Open Ocean Sharks Threatened With Extinction.' http://www.iucn.org/?3362/Third-of-open-ocean-sharks-threatened-with-extinction
[107] 'Reports to Congress Pursuant to the Shark Finning Prohibition Act of 2000.' Accessed Feb 20 2012. NOAA fisheries. http://www.nmfs.noaa.gov/ia/intlbycatch/rpts_shark_finning.htm

ocean, growing up to two meters in length and living for up to fifty years. It reaches sexual maturity after a decade and has relatively low fecundity. These biological characteristics make it particularly vulnerable to overfishing. Due to its large size, few bones, and lack of a fishy taste, the Patagonian Toothfish was remarketed as 'Chilean Sea Bass' and introduced into the international market in the 1970s. Since then, demand for Patagonian Toothfish has exploded given the decline in other premium quality fish due to overfishing. Worth up to ten US dollars per kilogram in the United States and Japan,[108] with fishing vessels often landing 200 to 300 tons of product per trip,[109] there are powerful market incentives to illegally catch Patagonian Toothfish.

In the late 1990s and early 2000s, IUU Toothfish fishing nearly collapsed many fisheries in the Southern Ocean[110] in spite of regulations the CCAMLR who independently put in place conservation measures, including total allowable catch quotas and a catch documentation scheme.[111] However, CCAMLR has had problems enforcing these measures. The Patagonian Toothfish range lies both within various states' EEZ's, (Australia, France, Chile, etc), the high seas, and the seas that are regulated by CCAMLR. This creates an issue, since there is no management regime that deals with Patagonian Toothfish as a whole. CCAMLR's catch documentation scheme requires boats to list where their catch was taken, but it is impossible for CCAMLR to verify whether or not the boat was fishing inside or outside of CCAMLR's

[108] "A history of the Patagonian Toothfish Fishery." Australian Government, Dept of Sustainability, Environment, Water, Population, and Communities. Accessed Feb 16. http://www.antarctica.gov.au/about-...
[109] Anna Willock. 'Uncharted Waters: Implementation Issues and Potential Benefits of Listing Toothfish in Appendix II of Cites.' Traffic International 2002.
[110] Dean Bialek. 'Sink or Swim: Measures Under International Law for the Conservation of Patagonian Toothfish in the Southern Ocean.' *Ocean Development and International Law* 34:2 105-137
[111] Ibid.

managed waters.[112]

Due to the fact that over 90 percent of Patagonian Toothfish products enter the international market, CITES, through its capacity to regulate international species trade, was asked to complement the primary conservation and management role provided by CCAMLR.[113] CITES recommended that its signatories respect CCAMLR's catch documentation scheme by only buying legally caught Patagonian Toothfish, but didn't agree to list Patagonian Toothfish under Appendix 1 or 2. Once again, CITES was stuck banning all commercial trade of Patagonian Toothfish underneath Appendix 1, or implementing a redundant permitting structure underneath Appendix 2. A modified Appendix 2 would have allowed CITES to partner with CCAMLR in protecting Patagonian Toothfish in a meaningful way, by regulating its trade from the landing to major markets in Japan, the EU, and the United States.

International Legal Documents and Flag-State Jurisdiction: Conclusion and Recommendations

This section reveals that in cases where fisheries management has failed to protect a fishery, and the fish is at risk of endangerment or extinction, CITES should act as a complementary conservation tool to the RFMO already in place. RFMOs do not have the jurisdiction, funding, or political willpower to limit the capture of a depleted fish stock, the CITES agreement should step in to ban the trade of that fish stock, eliminating the economic incentive for IUU fishing.

[112] "Continuing CCAMLR's Fight Against IUU Fishing for Toothfish" in Traffic Bulletin: 2008, pp. 7. www.worldwildlife.org/ www.**traffic**.org/species-**report**s/**traffic**_species_**fish**31.pdf *accessed 2/11/2012*
[113] M. Lack and G. Sant. "Patagonia Toothfish: Are Conservation and Trade Measures Working? Traffic Bulletion: 2001, pp. 118. www.worldwildlife.org/what/globalmarkets/wildlifetade. accessed 2.10.2011

Asset Forfeiture

Carolyn Gilbert

Introduction

If the dual role of enforcement is to deter against crime and to provide financial incentives to obey laws, asset forfeiture is one important tool that has a place in international MPA protection. In the status quo, even countries resolved to protect marine life are faced with scarce resources, and are left unable to identify or prosecute those that violate marine law. Further hurting enforcement, the current system in many developing countries acts as a disincentive for reporting transgressors: it is more profitable to take a bribe than to report a violator. Not only is it important to raise the funds needed for technology, manpower, and legal proceedings, it is also important to transform the way the system works so that ordinary citizens have a stake in supporting, not undermining, law enforcement. Asset forfeiture is one of several important tools that can help achieve this. Currently, asset forfeiture plays a role within developed countries such as the U.S. through organizations like NOAA, but it is further delineated in policies regarding domestic and international drug trade, money laundering, and piracy enforcement. Working definitions regarding forfeiture can be pulled from these texts and applied to MPA enforcement.

Asset forfeiture is the government seizure of property connected to illegal activity. It appears in various forms but can ultimately be traced back to English Common Law. Consequently, asset forfeiture is most commonly employed—and has greater precedential support—in the United States, Canada, UK, Ireland, South Africa, Italy, and Australia. However,

it is also present in several multilateral and bilateral agreements in fighting crime. It is also present in several international agreements through organizations such as the UN and the EU.

The difficulty arises when jurisdictions overlap, and more so when there is a gap in jurisdiction. Such overlap occurs in international waters, or, the high seas. Overlap makes it easy for violators to avoid prosecution, as they can skip from one state's jurisdiction to another, and license themselves in relatively weak or delinquent states. The goal must be to create a system where the incentive acts in favor of law enforcement. This means creating an international environment in which asset forfeiture can play a role in every state, not just in developed countries.

In the case of asset forfeiture, the State can choose to try the person or the property. The term *deodand* refers to guilty property, meaning that the property itself becomes a defendant and is forfeited by the individual. In the case of our recommendation, boats used for illegal fishing in MPAs would be subject to confiscation by involved authorities. Asset forfeiture is not an end-all for funding enforcement of MPAs, but it can be an important piece among many in bringing about a fundamental change in the enforcement system. By implementing asset forfeiture, the motive to engage in activities such as illegal fishing or dumping diminishes. The costs slowly begin to outweigh the rewards. While it is not without its drawbacks, examples of asset forfeiture in developed countries and multinational agreements can serve as successful models for MPA law. We can reformulate the concept and apply it to the needs of developing countries as well.

Historical Definition of Asset Forfeiture

The aforementioned term *deodand* is from old English Common Law, but it was not until the 1970s that asset forfeiture was used more extensively. By the 1990s it became a prominent

law enforcement tool. In the United States and several other developed countries, there are two kinds of asset forfeiture: criminal and civil. Criminal asset forfeiture requires the government to prove that the defendant (the owner of the property) is guilty beyond an unreasonable doubt. This is to say that the government has the *burden of proof*. The prime objective is to punish the defendant. Civil asset forfeiture is *in rem,*[114] meaning the property becomes that of the defendant, regardless of the innocence or guilt of the property owner him or herself. The objective becomes the punishment of the property, and to remove it from further criminal action regardless of the actions and status of the property owner.

The property owner becomes a third party claimant; the burden of proof is shifted onto their shoulders to demonstrate that the property did not aid any illegal activity. In civil asset forfeiture, the government standard is proof by a preponderance of evidence, which can be based on hearsay and circumstantial evidence (a lesser burden than reasonable doubt standard in criminal cases).[115] Removing the property owner from the crime itself also permits authorities to seize the property regardless of whether the owner has fled or is deceased. Subsequently, civil asset forfeiture is more common in drug and money laundering cases.

Legal Precedents in the United States

Asset forfeiture is authorized for use in several areas, spanning from drug smuggling and piracy to many white-collar crimes like money laundering and bank fraud. It is in essence an involuntary resignation of property upon the commission of a crime. "A 'seizure' is, at most, a temporary deprivation or property."[116] The government holds custody of the property, but the

[114] Jaipul, Sonia pg 177
[115] Ibid.
[116] Cassella, Stefan. Pg 331

title does not pass to the government until a *forfeiture order*, or ruling against the property, is made.[117] The Supreme Court has worked out an applicable definition through individual court cases. Similarly, legislation has clearly illustrated the place of seizure in maritime law. For instance, 16 U.S.C. § 1860. (Regarding the National Fishery Management Program) states:

> "(a) In general any fishing vessel (including its fishing gear, furniture, appurtenances, stores, and cargo) used, and any fish (or the fair market value thereof) taken or retained, in any manner…shall be subject to forfeiture to the United States. All or part of such vessel may, and all such fish (or the fair market value thereof) shall, be forfeited to the United States pursuant to a civil proceeding under this section."[118]

This text is an example of what the term *assets* would mean in application to illegal fishing. Not only is the boat subject to seizure, so too is the equipment and cargo on board, as well as the proceeds. 'Proceeds' itself is a definition that has been discussed in legal literature, and is delineated further below. This law applies to boats from flag-States in addition to the U.S., as long as the illegal fishing in question occurs within U.S. territorial waters. Further, 16 U.S.C. § 5509 (regarding High seas fishing) states:

> "(a) Any high seas fishing vessel (including its fishing gear, furniture, appurtenances, stores, and cargo) used, and any living marine resources (or the fair market value thereof) taken or retained, in any manner…shall be subject to forfeiture to the United States. All or part of such vessel may, and all such living marine resources (or the fair market value thereof) shall, be forfeited to the United States pursuant to a civil proceeding under this section…If a judgment is entered for the United States in a civil forfeiture proceeding under this section, the Attorney General may seize any property or other interest declared forfeited to the United States, which has not previously been seized pursuant to this chapter or for which security has not previously been obtained."[119]

While this extends the grasp of U.S. legislation to international waters, it only applies to U.S. ships. It therefore remains an insufficient tool to reach other violators, even if we have the means

[117] Ibid.
[118] U.S. Department of Justice,"Selected Federal Asset Forfeiture Statutes." 2006. http://www.justice.gov/criminal/foia/docs/afstats06.pdf *Amended*: Sustainable Fisheries Act, Pub L 104-297, Title I, § 114(d), Oct 11, 1996, 110 Stat. 3559, 3599.
[119] Ibid. *Enacted:* Fisheries Act of 1995, Pub L. 104-43, Title I, § 110, Nov. 3, 1995, 109 Stat. 366, 375

to catch them. Laws such as this are effective only when the entire international community supports similar policy. Yet it nevertheless serves as a model for what domestic policy could look like, were this to be modeled elsewhere.

These are just two examples of a multitude of instances in which we find precedent in U.S. national law for asset forfeiture in MPA protection. In each example, we see that not just the boats are subject to forfeiture, but also the value of the illegal goods (fish or otherwise) obtained during the illegal activity as well as the other properties that helped to facilitate said illegal activity.

What the State Can Take

NOAA utilizes forfeiture through the AFF. Indeed, asset forfeiture is an important part of mitigating the enforcement costs paid by taxpayers. The NMSA, whose objective is to protect marine resources, provides several tools for protecting MPAs, including asset forfeiture: NOAA is authorized to assess civil penalties up to $130,000 per day per violation.[120] Again, this is for U.S. boats or boats within U.S. territorial waters.

UK asset forfeiture is largely defined by the POCA (2002). There, property must be obtained "by or in return for unlawful conduct."[121] The court must calculate the benefits from the criminal lifestyle of the defendant. In UK law, benefits subject to seizure entail any property or expenditure by the defendant within the relevant period "unless the defendant can show the assumption is incorrect or that there would be a serious risk of injustice if the assumption were

[120] Sanctuaries Web Team, Revised June 07, 2011. Office of National Marine Sanctuaries National Marine Sanctuaries. (See sections 306, 307, and 312 of National Marine Sanctuary Act)
[121] Proceeds of Crime Act 202, s 242 (UK) cited in Kennedy, Anthony "Designing a civil forfeiture system: an issues list for policymakers and legislators" Assets Recovery Agency, Belfast, UK. Journal of Financial Crime, Vol. 13 No. 2 2005 pp. 132-163 Emerald Group Publishing Limited 1359-0790.

made."[122] UK law extended the realm of asset forfeiture beyond the property physically used in crime to any property obtained by means of criminal activities.

Ireland defines proceeds of a crime similarly—it is any property received by, as a result of, or in connection with a crime.[123] The material is investigated, confiscated, and disposed of by the Criminal Assets Bureau—a group created for the purpose of handling asset forfeiture.

In places such as Australia and select Canadian Provinces, the court can refuse to issue a forfeiture order if they find that forfeiture is not in the interest of justice. One instance in which a court may refuse to issue a forfeiture order would be an issue regarding proportionality or inherited or newly acquired property. In Australia, there are four conditions under which the government can refuse to issue a forfeiture order: first, if it would cause a hardship to anyone besides the suspect; second, if the property can be more appropriately used as was intended; third, when considering the gravity of the offence; and lastly, in any other matter the court thinks fit.[124] The abstraction of this model is to avoid injustice against innocent third parties or possible victims of the crime.

Uses of Seized Funds

In the case of NOAA, there are specific things that AFF cannot go towards. Such instances include employee salary or benefits, the purchase of vehicles designed to carry out enforcement duties, funding for travel not related to specific investigations, training, or equipment other than what is directly related to specific investigations. Up to 20 percent or

[122] 28 U.S.C. 981 (i)(1) (USA)
[123] Crawley
[124] Kennedy, Anthony "Designing a civil forfeiture system: an issues list for policymakers and legislators" Assets Recovery Agency, Belfast, UK. Journal of Financial Crime, Vol. 13 No. 2 2005 pp. 132-163 Emerald Group Publishing Limited 1359-0790

$20,000, whichever is less, can go towards compliance assistance and procedural costs.[125] The money can be used, for instance, to send representatives to international and bi-or multi-lateral negotiations regarding MPA enforcement. It can also be used for enforcement-unique technology, funding towards international unregulated fishing through organizations such as International Monitoring, Control and Surveillance Network.

In Australia, the government must give what money is left over after paying for the proceeding's costs to funds for victims, including other states. This is under the equitable sharing program, "whereby the crown shares the proceeds resulting from a breach of the criminal law where there has been a significant contribution to the recovery of the proceeds."[126] In Western Australia, the money goes into a fund that can be withdrawn from for development of future programs and legislation in regards to asset forfeiture.

Where the money can be used depends on the State (or Province) in question. For example, in Manitoba, once an asset is seized it is up to the government to decide where the money is to be used. Meanwhile, in Ontario, there are specific purposes the money must be used for, such as victim compensation and prevention against future crimes.

Proportionality

Another issue regarding asset forfeiture in general, and one that is particularly relevant to asset forfeiture in MPA law, is that of proportionality. Is it fair for the government to penalize a local family that violates MPA law by fishing for dinner the same way one would penalize a large corporate fishing boat violating MPA law? The answer is a clear and resounding no. This dilemma is one that has been addressed by the U.S. Supreme Court: "…we are troubled by the government's view that any property, where it be a hobo's hovel or the Empire State Building,

[125] NOAA Policy on Prohibited and Approved Uses of the Asset Forfeiture Fund. March 16, 2011. Web.
[126] Kennedy.

can be seized by the government because the owner, regardless of his or her past criminal record, engages in a single drug transaction."[127] Proportionality must take into account the number and severity of violations, as well as the monetary value of the proceeds of the crime. All of these will be discussed in the policy proposal.

All of these variations in different models of asset forfeiture reflect how individual states have found a place for asset forfeiture in their enforcement process. Something must be said for the fact that each of these countries has a tremendous amount of resources and a strong legal system in which asset forfeiture can function. Nevertheless, these models do help us in determining what national policies can look like, especially regarding marine protection. The trick is how to adopt this in an international arena without an international enforcer, acts of noncompliance, and weak states. There is some precedent in international law for asset forfeiture agreements, such as drug enforcement and money laundering. Here, we can find models and definitions that could be replicated in the UNCLOS.

Asset Forfeiture in International Agreements

There are instances of asset forfeiture in international agreements such as the United Nations Convention Against Transnational Organized Crime, held in Palermo, Italy (the Palermo Convention)[128] and the United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances, held in Vienna (the Vienna Convention)[129]. These documents provide a model for how asset forfeiture could be included in the UNCLOS or the Convention on Biological Diversity.

[127] Kennedy. *United States v. One Parcel of Property Located at 508 Depot Street, Garretson, Minnehaha County, South Dakota* 964 F.2d 814 (8th Cir, 1992), The case later the US Supreme Court as *Austin v. United States* 113 S. Ct. 2801 (1993).
[128] United Nations Convention Against Transnational Organized Crime, United Nations 2000. Palermo, Italy
[129] United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances, United Nations 1988. Vienna, Italy.

Definitions

The Palermo and Vienna Conventions provide some basic definitions regarding asset forfeiture that could be modeled:

- Property: assets of every kind, whether corporeal or incorporeal, movable or immovable, tangible or intangible, and legal documents or instruments evidencing title to, or interest in, such assets.

- Proceeds of crime: any property derived from or obtained, directly or indirectly, through the commission of an offence.

- Freezing or Seizure: temporarily prohibiting the transfer, conversion, disposition or movement of property or temporarily assuming custody or control of property on the basis of an order issued by a court or other competent authority."[130]

Articles Regarding Jurisdiction and International Cooperation

Furthermore, the Palermo and Vienna Conventions speak to some of the same issues that arise regarding seizure on the international level. For instance, Article 13 of the Palermo Convention is titled *International cooperation for the purposes of confiscation*. It proposes that,

> "A State Party that has received a request from another State Party having jurisdiction over an offence covered by this Convention…situated in its territory shall, to the greatest extent possible within its domestic legal system…take measures to identify, trace and freeze or seize proceeds of crime, property, equipment or other instrumentalities."

Functionally, this permits States to continue to prosecute violators even as they cross territorial boundaries, and urges individual States to pursue violators even if the crime occurred within another country's borders. Article 14 then follows by explaining the procedures for the disposal of confiscated property in accordance with domestic law, clarifying that the proceeds can be shared between multiple invested countries. Section 5 of Article 4 in the Vienna Convention has nearly identical language regarding the disposal of property and use of subsequent funds.

[130] Ibid

Another significant and relevant area addressed in these documents is that of jurisdiction. Article 15 on *Jurisdiction* in the Palermo Convention and Article 4 on *Jurisdiction* in the Vienna Convention both write that a State Party has jurisdiction when the offence is committed within its territorial boundaries or when the offence is committed on board a vessel that is flying the flag of that State Party. The Palermo Convention continues by including situations when the offence is committed in another country but "with a view to the commission of a serious crime within its [State's own] territory."[131] Likewise, in MPA law, an illegal fishing boat is under the jurisdiction of a State if it flies its flag or is within the State's boundaries. This brings to attention two more pressing issues. The first is that of noncompliance (discussed below), and the second is of mutual assistance.

Article 18 of the Palermo Convention, titled *Mutual legal assistance*, serves to help States that are eager to prosecute violators but lack the adequate resources or information. Section three of this article states that mutual legal assistance may be requested for "executing searches and seizures, and freezing"[132] among many other instances. For countries that are willing and able to work together, this provides a successful framework for the interplay between international and domestic enforcement law. Articles such as these could be effectively incorporated into the UNCLOS, and would likely produce similar results.

However, the same gaps and pitfalls would remain in jurisdiction. The first of these is noncompliance. Noncompliance with international agreements continues to be one of the greatest challenges to effective enforcement. By including a text on asset forfeiture into an international agreement such as the UNCLOS, a larger number of signatories would become committed to implementing the program, and the small number of states that are not signatories would be

[131] Palermo Convention
[132] Ibid.

faced with a serious disadvantage and exploitation of their resources. This may help to reduce noncompliance, and make asset forfeiture a common feature of international MPA law.

A second issue is the variation amongst State Parties regarding the limitations on the monetary value of property that can be confiscated. While countries can work together to prosecute criminal action in a given territory, they must operate under the legal system of the country that has jurisdiction over the offender. Equally as ineffective as noncompliance are laws that don't adequately deter illegal action. For instance, if the fine for violating MPA law in one country is significantly lower than in another country, a boat could commit crimes in one territory and be 'caught' and prosecuted under the more lenient law of the neighbor country. So while vessels can cross borders, legal systems and jurisdictions cannot. Addressing this challenge is a key component to addressing the larger issue of noncompliance.

The Law of the Sea

Article 94 of the UNCLOS, regarding the Duties of the flag State, states that "every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag."[133] In particular, States are charged with monitoring ships that fly under their flag, and enforcing and prosecuting those ships which violate international law. Individual State parties can decide if asset forfeiture is a mechanism through which they enforce laws on the high seas. Section 6 of Article 94 furthers that when a State has clear grounds that a breach in this duty has occurred, they may exercise their right to report to the flag State in question. After receiving a report of this manner, the flag State is charged with a duty to investigate the allegations and to take necessary action.[134] The question remains what to do when

[133] UNCLOS
[134] Ibid

a State refuses to prosecute violations of this manner. Asset forfeiture can be an effective tool, but only in cases where a State has the desire.

Asset Forfeiture Policy Recommendations

Community-Based MPAs

Local ports operate primarily under their national legal system, using asset forfeiture as defined by that larger system. If they have the tools to assist in a seizure, they receive proportional gains from the proceeds of the confiscated property. This funding would go directly towards boosting man-power and enforcement, but since their input into enforcement will likely be proportionately smaller, their proceeds will be similarly small and may not provide much improvement in enforcement capabilities. Asset forfeiture is unlikely to be the best option for these smaller MPAs unless they have the help of larger national or international policing and enforcing organizations.

(Cross-Regional) National, EEZ MPAs

Following legislative and precedential documents of countries that already have asset forfeiture in their legal systems, individual State Parties that sign onto the Law of the Sea can find an arrangement that works best within their legal and political structure. By signing onto international law, however, there will be certain guidelines that they must follow to ensure effectiveness. This includes:

- Setting a standard for admissible evidence, such as photos from UAVs or data from an international or governmental source. This will avoid incentivizing false incrimination.
- Setting a standard for what the proceeds of confiscated property can go towards. Countries can set their own standards, but the money cannot go towards government programs other than of present and future MPA enforcement or to victim compensation. The money cannot go towards increasing employee salary or benefits.

- Setting a minimum penalty for violators within individual EEZs. This helps to reduce the problem of inconsistency and failed deterrence. It also reduces the need to set up a system of cross-jurisdiction, where one State's forfeiture rules apply within another State's EEZ.

- Implementing a system of proportionality, minimizing instances of injustice and targeting the appropriate offenders.

- Promoting international cooperation through multi-lateral and bi-lateral agreements, permitting enforcing organizations to cross borders and aid in seizure outside of their exclusive EEZ.

The High Seas

Also to be included in the Law of the Seas is an article regarding MPA violations in international waters. By signing the Convention, State Parties agree to increase funding for deep sea monitoring technology, and this data should be made available to the signing parties. Communication and cooperation would then permit one country to send information on offenders to another country where the said offenders are likely to come to port. There, asset forfeiture would exist within the port-state's jurisdiction, but the proceeds could be split between the assisting parties as well.

The primary recommendation is that enforcement officers have jurisdiction to confiscate violators even if they fly the flag of another State Party. Upon confiscation, the two aggrieved States (the State that assisted in capturing the vessel and the State whose flag the vessel sails under) agree upon which legal structure to operate under during the asset forfeiture procedure. But by signing the Law of the Sea, they agree that prosecution can take place under either legal system.

Certification and Eco-labeling

Gee Lee

Securing Accessing Rights

Certification and Eco-labeling

Certification and eco-labeling are two mechanisms that are utilized by states to ensure and control product quality. By allowing the importation of products that meet the requirements, goals to prevent IUU fishing can be achieved. At the market level, they appeal to consumers who are environmentally and socially aware. Objectives can be achieved not only through the force of market demand, but also through market supply: the fishing industry is economically incentivized to follow good management models, or will seek to address environmental and social issues that arise from poor management. However, the willingness to pay a premium for certified or eco-labeled goods can be achieved only through standardized regulations and transparency in management: coverage of scheme needs to be well designed to facilitate successful enforcement and monitoring, which facilitates consumers to build trust and make informed choices.[135]

Certification Scheme

Certification is a subset of eco-labeling, which directly manages the process of fishing. It is essentially a single-issue label that concerns fishing management. It includes catch documents that record the fulfillment of requirements set out by the industry, the national government, or other multilateral agreements. It is most commonly mandated by the government and agreed upon by regional fishery management organizations to prevent IUU fishing. It is arguably most

[135] Fisheries and Aquaculture Department, "Labeling and Certification," Food and Agriculture Organization of the United Nations, http://www.fao.org/fishery/topic/13293/en

effective when compulsory multilateral catch documents and certification requirements are enforced and ensure that the final market adopts mandatory compliance with the product certification scheme.[136] The concept of certification was highly emphasized by the FAO council's 2001 IPOA[137] in which it asserted the adoption of multilateral catch documentation and certification requirements. Article 69 states: "trade-related measures to reduce or eliminate trade in fish and fish products derived from IUU fishing could include the adoption of multilateral catch documentation and certification requirements, as well as other appropriate multilaterally-agreed measures such as import and export controls or prohibitions. Such measures should be adopted in a fair, transparent, and non-discriminatory manner. When such measures are adopted, States should support their consistent and effective implementation." Article 76 stresses the importance of creating a standardized system to facilitate enforcement and monitoring through the assistance of feasible technology: "certification and documentation requirements should be standardized to the extent feasible, and electronic schemes developed where possible, to ensure their effectiveness, reduce opportunities for fraud, and avoid unnecessary burdens on trade." These two articles from the 2001 IPOA have drawn attention to IUU fishing worldwide and have since created momentum for the support of a standardized certification system.

Certain costs arise from management controls for the fishing industry which can encourage IUU fishing. Certification can redress the issue of circumventing regulation and management; the question then is how to control and manage cost effectively through certification. There are two common scenarios that encourage IUU fishing: firstly, the higher the economic gain from avoiding management control, the higher the chance for illegal behavior to

[136] FAO fisheries Department, "Product Certification and Ecolabeling for Fisheries Sustainability," Food and Agriculture Organization of the United Nations, ftp://ftp.fao.org/docrep/fao/005/y2789e/y2789e00.pdf
[137] FAO Corporate Document Repository, "International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing," Fisheries and Aquaculture Department, http://www.fao.org/docrep/003/y1224e/y1224e00.HTM

occur. Secondly, when the risk of detection is low, fishers will likewise attempt to avoid management controls. Making cost effective compulsory certification can serve to redress this issue by limiting market access for uncertified products, which will incentivize fishers to avoid IUU fishing. Without revenue from IUU fishing, fishers are encouraged to follow certification regulations.[138]

Compulsory certification systems for fishery products include the CCAMLR, the CCSBT, the ICCAT, the U.S. Tuna Tracking and Verification Program, Japan's Food and Agricultural Import Regulations and Standards, and the EU's compulsory certification on all fish products. For example, under the Antarctic Treaty System, CCAMLR requires all members, which represent ninety-five percent of the Toothfish market, "to only accept catches whose origins have been documented under the Scheme."[139] The EU's compulsory certification system is also worth mentioning. It requires two to three documents, including EU Export Health Certificates, EU IUU catch document, and EU 'Annex IV' catch document (NOAA issued certification for fishery products caught in a country outside of U.S., transported through the U.S., and destined for EU). These are some successful models that can be adopted by other countries or regions in a global effort to prevent IUU fishing. All countries should adopt compulsory certification for fishery products as part of the certification scheme to overcome IUU fishing by ensuring final market compliance with certification requirements. There are certainly challenges and controversies to certification management: lack of transparency, possible hindrance to market access, and possible erosion of national competiveness of the developing

[138] FAO Corporate Document Repository, "Product Certification," Fisheries and Aquaculture Department, http://www.fao.org/docrep/005/y2789e/y2789e07.htm#bm07.1

[139] Department of Sustainability, environment, Water, Population and Communities, "CCAMLR Continues Effort to Protect Toothfish," Australian Antarctic Division, http://www.antarctica.gov.au/about-us/publications/australian-antarctic-magazine/2001-2005/issue-1-autumn-2001/international/ccamlr-continues-efforts-to-protect-toothfish

nations that heavily rely on the export of fishery products and have difficulty meeting certification standards. Possible solutions to the problems will be discussed.[140]

Eco-labeling Scheme

Eco-labeling and certification have overlapping goals: both are implemented to incentivize better fishing management. Eco-labeling generally relies on life-cycle assessment to value the environmental and social impact of the production process, which is commonly called 'from cradle to grave.' It is often documented and monitored by a chain of custody to ensure the final product does not contain any element that undermines the product standards. Eco-labeling often addresses and promotes sustainable management that helps to create environmentally friendly production processes. There are also single-issue labels, such as Dolphin-Safe Certification by the U.S. Department of Commerce. The essential ingredient for successful eco-labeling is their credibility: standards and criteria need to be clear and adopted by the fishery industry.

There are three levels of eco-labeling. The first party labeling scheme is of 'self-declaration,' which can be done through media or advertisement to address certain environmental or social issues. The second party labeling scheme is done through the industry which the fishery business belongs, and members often set out the criteria and draw external expertise from research or environmental organizations. Third party labeling includes an initiator that can either be public or private and who is independent from whoever is involved in the commercial process. It requires the producer to document the chain-of custody of their products. The three levels of eco-labeling can either be mandatory or voluntary. Mandatory eco-labeling is

[140] Fisheries and Aquaculture Department, "Labeling and Certification," Food and Agriculture Organization of the United Nations, http://www.fao.org/fishery/topic/13293/en

commonly required by the government, whereas voluntary eco-labeling can be a mechanism utilized by the fishery business to increase consumer demand, similar to certification. Eco-labeling serves to provide information on product characteristics and attributes; it functions broader than certification in the sense that it often tackles the issue on environmental and social impacts of the production process. There are controversies on the practice of eco-labeling as well since it can act as a façade for trade barriers.[141]

Addressing Controversies on Certification and Eco-labeling

Standardization for both certification and eco-labeling can be achieved through international cooperation; standardization and transparency for certification and eco-labeling are essential for sustainable management and building consumer trust. If the scheme for certification is unclear and not well defined Parties will avoid compliance, which indirectly results in consumers' lack of trust in the certification and eco-labeling systems. Moreover, it is a challenging task to draft an international law for certification and eco-labeling that *all* countries around the globe will find incentive to sign onto. Differences in economic and social development, cultural perspectives, environmental issues, and various other concerns may deter a country from becoming signatory to international law.

The WTO defers the difficulty in standardizing international regulation to 'international agreements or bodies with appropriate expertise.' This issue is being addressed in the TBT agreement, which asserts that standards can be recognized by including those set by 'central government, local government, or non-governmental standardizing bodies.' This is how *de facto* international standards can be created to facilitate the transparency and efficiency on certification

[141] Food and Agriculture Organization of the United Nations…

and eco-labeling. Annex 3 in the TBT Agreement, the 'Code of Good Practice,' is 'open to acceptance by any standardizing body within the territory of a Member of the WTO, whether a central government body, a local government body, or a non-governmental body; to any governmental regional standardizing body one or more members of which are Members of the WTO; and to any non-governmental regional standardizing body one or more members of which are situated within the territory of a Member of the WTO.'[142]

Furthermore, TBT Article 4.1 asserts that the 'Code of Good Practice' should be applied and recommended to local governments to take such measures to facilitate and formulate international standards for certification and eco-labeling. By encouraging local governments, non-governmental standardizing bodies, and regional standardizing bodies to accept and comply with the 'Code of Good Practice,' these goals can be achieved. The assertions essentially encourage standardizing bodies to harmonize standards at an international level, avoid overlapping definition, and providing feedback at a territorial level to incorporate the formation of new standards. Lastly, information on compliance to the 'Code of Good Practice' should be collected by an international agency to ensure transparency and legitimacy of certification and eco-labeling agencies. This is being elaborated in Annex 3, section C,

> "standardizing bodies that have accepted or withdrawn from this Code shall notify this fact to the ISO/IEC Information Center in Geneva. The notification shall include the name and address of the body concerned and the scope of its current and expected standardization activities. The notification may be sent either directly to the ISO/IEC Information Centre, or through the national member body of ISO/IEC or, preferably, through the relevant national member of international affiliate of ISONET, as appropriate."

[142] WTO Analytical Index: Technical Barriers, "Agreement on Barriers to Trade," World Trade Organization, http://www.wto.org/english/res_e/booksp_e/analytic_index_e/tbt_02_e.htm

The *de facto* international standards can serve as a mechanism to aid against future challenges that certification and eco-labeling face and deal with current issues on lack of transparency and consistency of standards for certification and eco-labeling systems.

A successful standardizing body is the MSC which operates not only certification and eco-labeling programs, but also educational and consumer awareness programs. MSC's Developing World Program has been specifically designed to assist fisheries of developing nations in achieving certification standards. It ensures that fishers from these nations obtain the same market access as other developed nations. This is an important step in certification and eco-labeling programs, since more than half of the internationally traded seafood is from developing countries. Moreover, the biggest markets for seafood importation are the EU, the United States, and Japan, where the majority of consumers are environmentally and socially aware. China represents a recent addition and is quickly becoming one of the biggest seafood importers. Due to a lack of resources to meet the certification and eco-labeling standards, there is a potential trade limitation imposed on fishers in developing countries. MSC's Developing World Program can address this issue and encourage consumers in developed nations to purchase goods from developing countries, with the confidence that these goods were produced in a sustainable way. This is a great opportunity for developing countries to utilize their comparative advantage and abundance of marine resources to assist their economic development. By designing a sound certification and eco-labeling system that is standardized and internationally transparent, fishers in developing nations will have the incentive to preserve the marine resources they rely on as a source of income; sustainable management for fisheries becomes their livelihood.[143]

[143] "Working with Developing Countries," Marine Stewardship Council, http://www.msc.org/about-us/credibility/working-with-developing-countries/working-with-developing-countries.

Securing Accessing Rights: Community-Based Conservation and Privatization

Managing natural resources for preservation purposes has proven difficult in developing countries, especially when management is under the control of centralized governments. The difficulty can arise from a lack of sound legal institutions and poorly defined property rights. There are often conflicts of interest between different users of natural resources, specifically between traditional uses and those of tourism. A weak government institution can encourage corruption, while the lack of resources for legal enforcement will lead to severe natural resource degradation. Moreover, with the size of national parks, it is almost impossible to have enough government personnel to safeguard the resources within these vulnerable areas. This phenomenon is most evident in politically unstable countries, such as Madagascar[144], where recent political turmoil has led to poor legal enforcement. The two national parks, Masoala and Marojely National Parks, erected for the preservation of natural resources, have become targets for invaders and timber barons who are economically and politically well connected. These invaders are able to obtain fake permits in order to sell the timber illegally to another country. It is estimated that one to two hundred Madagascar Rosewood trees are cut down every day.

Unfortunately, this phenomenon is indirectly encouraged by the CITES treaty, which lists the Brazilian Rosewood as an endangered species, and makes it illegal to trade Brazilian Rosewood.[145] Because of the Brazilian Rosewood's illegal trading status, wood suppliers have shifted demand to the Madagascar Rosewood, not because it is the next best alternative to the Brazilian Rosewood, but because Madagascar's legal institution is weak and Brazilian Rosewood

[144] Barry Bearak, "Mayor Declares a Coup in Madagascar," New York Times, January 31, 2009.
[145] Richard Bruné, "CITES Regulation of Brazilian Rosewood," Soundboard, 1992, 31-32.

is very easily targeted.[146] This example illustrates some of the unintended consequences that arise out of international treaties. With this in mind, there are two suggestions for increasing efficiency in resource management: community-based resource management and private resource management. Both of these systems increase policing power by providing well-defined property rights, where individuals involved are incentivized to protect and manage the natural resources. Community-based resource management has benefited over recent years via funding donations from various international organizations. However, transferring central authority to a local, community-based level has proven challenging in developing nations. Management capabilities are also limited by a lack of tradition and established institutions, bringing private resource management to light as an alternative to community-based resource management.

Community-Based Resource Management

Elinor Ostrom is a political economist who won the 2009 Nobel Memorial Prize in Economics of Science, and is the only female recipient to ever win a Nobel Prize in that category. Her book, *Governing the Commons*, published in 1990, addresses the issue of CPR. One of the chapters, titled *Analyzing long-enduring CPRs,* examines various community-based resource management models and discusses 'underlying design principles shared by successful CPR institutions and determines how those design principles affect the incentives of appropriators so that the CPRs themselves and the CPR institution can be sustained overtime.'

Ostrom observes that these communities have well-defined obligations and rules that the community members respect, follow, and find purposeful. These rules are the result of trial-and-error over time and were improved upon and reorganized to suit the needs of the locals. Next,

[146] Lucienne Wilma, editor-in-chief, Madagascar Conservation & Development, Vol. 5, Issue 1 (2010): 65.

locals were able to participate and facilitate in shaping the rules and obligations via feedback to increase the efficiency of the organization. There are monitoring systems to keep track of individual work and any violations that occur. Appropriate punishment is given to violators. Furthermore, the community organization acquires respect from outside authorities such as the government, which allows for their self-determination. These are the basic rules or 'local laws' that govern the community-based resource management model that can be applied to managing community-based MPAs. Common goals and well-defined property rights are integral to the success of community-based MPAs.[147]

Private Resource Management

An alternative to community-based resource management is privatization. The economics of managing protected areas through sustainable management, ecotourism, and business projects have proven feasible in developing countries such as Tanzania, the South African Republic, Namibia, Botswana, and Kenya. The CHICOP that took place in Zanzibar, Tanzania, is a success story among private run MPAs.[148]

The Chumbe Reef Sanctuary, as part of CHICOP, is considered one of the best and most resilient reef habitats, where reef damages due to storm or temperature change can rebound within a couple of weeks to a year. "Coral growth and diversity is among the highest in the region, and Chumbe has at least 90% of all the hard coral species that have ever been recorded from Eastern African reefs."[149] The Chumbe Reef Sanctuary is part of an increasing number of privately initiated MPAs, operating under a difficult institution and legal environment, and is the

[147] Elinor Ostrom, *Governing the Commons* (Cambridge: University of Cambridge Press, 1990), 88-100.
[148] Chumbe Island Coral Park, "Research Survey and Monitoring," CHICOP, http://www.chumbeisland.com/reef-sanctuary/research-surveys-and-monitoring/
[149] CHICOP.

first to be established in Tanzania. Ecotourism is expected to be the leading industry and source of income for many African countries. To help facilitate development, protected areas have to figure out how to sustainably manage ecotourism. Tanzania was a socialist State after its independence, and has only recently pursued a more liberalized economy which allows foreign investment. However, the institutions providing for private investment are rarely transparent in Tanzania, as in many other African countries. Proceeds from tourism are often times not reinvested in the preservation of natural resources and result in environmental degradation. In Zanzibar, however, despite various challenges with the new environmental legislation, CHICOP was approved and is privately managed as a protected area.[150]

The initiation of the Chumbe project was based on the idea that such protected areas can self-sustain through ecotourism, and that profits could be reinvested into conservation and environmental education for the local people of Chumbe Island. A lease for CHICOP as a tourism investment was acquired through the *Zanzibar Investment Protection Act* of 1986. In 1994 it was approved and legally justified under the provisions of the *Zanzibar Fishery Act 1988,* but with difficulty due to the lack of legal provision for conservation. The bureaucratic process has proven to be burdensome financially for CHICOP; the land lease, building permits, management agreement and scientific research took years to realize. Nonetheless, a sound management plan was developed through the work of various scientific research institutes and collaboration among the locals of Chumbe. For example, Chumbe park rangers are privately hired to protect the Island from invaders and illegal fishers. There have been many cases of local fishermen invading CHICOP, but the rangers communicate with these trespassers and inform

[150] Sibylle Riedmiller, "The Chumbe Island Coral Park Project: Management Experiences of a Private Marine Conservation Project," *ICRI-International Tropical Marine Ecosystems Management Symposium* (1998), http://www.reefed.edu.au/__data/assets/pdf_file/0006/1878/itmems_222-235_s05_3.pdf

them of the site's conservation purposes. The rangers carry no weapons and can only report invaders to CHICOP management, which unfortunately has very little power to engage government authority for assistance. Curiously enough, the rangers have built good relationships with the local fishermen and have gained their respect, which has persuaded most of the fishermen to steer clear of the protected areas. The education program implemented by CHICOP also facilitates the understanding of local fishermen towards conservation purposes, "[f]rom the most recent village visits, Dec05-Jan06, the general opinion regarding CHICOP was positive; most people from these villages understand the project's mission to conserve the reef and to increase environmental awareness in the community through the Education Programme."[151] Additionally, due to a shortage of marine resources in Tanzania, Chumbe rangers have been assisting the local fishermen in marine rescues and have become the *quasi*-authority around Chumbe Island.[152]

In conclusion, CHICOP serves as a successful model in conservation and profit-making in ecotourism, encouraging outside governments to embrace foreign investment. This example encourages implementing the feasible option of freehold ownership, which ideally would attract more foreign investment on top of a simple leasehold. Retirement plans for foreign investors that allow immigration to their investment location can also be an attractive feature for government consideration. Finally, the legal institution to support conservation projects needs to be better designed to avoid complicated bureaucratic processes, which will in turn attract even more foreign investment. This is a key opportunity for developing countries, and utilizes their comparative advantage for development. We recommend as a team that this model be adopted by

[151] Chumbe Island Coral Park, "Ranger Reports," CHICOP, http://www.chumbeisland.com/fileadmin/downloads/pdf/Conservation_Report_Mikala_Peters_Nov06-1.pdf
[152] Mikala Peters, "Conservation Report: For the Chumbe Reef Sanctuary & Forest Reserve," CHICOP (2006):10-13.

developing countries, to avoid environmental degradation that often times accompanies development. Environmental conservation, under sound institutions, can appeal to various stakeholders.

Concluding Legal Policy Chapter Recommendations

On a community level, we recommend creating well-defined goals and property rights. By incentivizing stakeholder cooperation, the legal framework regarding protection of resources is better fitted for individual communities.

Point of Catch:

Our first policy recommendation for legal regulation at point of catch is to include text on asset forfeiture in the UNCLOS. This text will include specific definitions of property, permissible evidence, a breakdown of the delegation of seized asset funds, and how these funds can be divided amongst multiple vested state parties involved in the seizure.

Our second policy recommendation for legal regulation at point of catch is to take Article 21(a) of the UN Fish Stocks Agreement and put it into the section on High Seas in the UNCLOS. This allows for the enforcement of high seas fishing vessels breaking RFMO conservation measures on the high seas by any nation party to the UNCLOS.

Point of Sale:

Our first policy recommendation for legal regulation of point of sale is to modify CITES Appendix 2 to regulate import control in addition to export control, add depleted commercial fish species to Appendix 2 of CITES treaty. The addition of import controls to Appendix 2 of the

CITES treaty would allow the CITES treaty to complement FMO enforcement measures of MPAs on the high seas by regulating the processing and distribution chain from the first point of sale to the customer.

Our second recommendation regarding the legal framework for the point of sale is to make certification compulsory. This will incentivize fishermen to eliminate participation in IUU fishing.

Lastly, create a *de facto* international standard that will facilitate the legitimacy of certification and eco-labeling. This will increase consumer participation and address environmental and social issues.

Chapter 3: Monitoring, Surveillance, and Enforcement

Dustin Dacuan, Matthew Fitzgerald, and Kristin Slouber

Chapter Summary

Key Policy Conclusions

Current monitoring and enforcement strategies of MPAs are insufficient in preventing illegal fishing and environmental health violations due to a lack of manpower, funding and effective surveillance technology. These practices must be re-examined in accordance with technology considerations in order to better monitor and enforce MPAs.

Background

Lack of proper enforcement mechanisms to monitor illegal activity is a major flaw in current MPA management, and many MPAs are reduced to mere "paper parks" as a result. One of the primary factors in the failure of MPAs is lack of sufficient funding for monitoring and enforcement. Both large and small scale MPAs face surveillance challenges; for smaller MPAs in the jurisdiction of developing nations, effective surveillance methods are often monetarily out of reach, while large scale MPAs on the high seas, on the other hand, are unprotected because of their size, location, and lack of single-party jurisdiction. While the challenges faced by the MPAs of developing nations are daunting, there is a wide range of options for mediation. Multilateral partnerships to implement naval alliances stand as a potential solution to such underfunded MPAs.

Policy Considerations

Effective monitoring, surveillance and enforcement methods must consider proper

implementation of existing technology, creation of educational campaigns to inform stakeholders about MPA regulations, and the formation of multilateral partnerships with other nations for enforcement. Surveillance technology depends on the size and location of the MPA, and while smaller MPAs can focus on improvement of their manned patrol fleets, high seas MPAs need to use satellite-based technology and data-sharing systems for effective monitoring. Educational campaigns for all MPAs need to engage stakeholders and inform them of the policies, rules, and regulations to set self-monitoring practices. Stakeholders must also participate in policy formation processes to enforce regulation buy-in. Finally, developing nations struggling to fund enforcement, surveillance, and monitoring strategies must explore multilateral partnerships to effectively adhere to regulations.

Key Recommendations

- Implement Community Based Marine Resource Management (CBMRM) to engage stakeholders, create advisory groups, and draft sustainable enforcement and monitoring plans with the help of the community.
- Create education, media, and publicity campaigns to inform stakeholders of MPA regulations and policies following the model of interpretive enforcement.
- Form partnerships with developing nations and NGOs for satellite and data sharing technology in order to improve large MPAs within EEZs as well as high seas MPAs.
- Create new funding models to pay for more surveillance technology and surveillance personnel.

Introduction

Monitoring MPAs for illegal activity is one of the most important components in managing a successful MPA. Without some type of monitoring or surveillance, enforcement becomes difficult, if not impossible, and jeopardizes tremendous amounts of work and effort. Enforcement practices vary around the world. MPAs located in the United States and other developed nations have a wide range of options to address these monitoring and enforcement concerns, whereas many other MPAs in regions across the world are limited in their technological capacity and political will, among others. Modern technology can provide law enforcement agencies or other organizations with the necessary means to incriminate perpetrators and protect these important environmental areas. The most effective technology, however, is often times too expensive for developing nations to purchase and maintain in working condition.[153]

Enforcement strategies all require certain prerequisites in order for effective action to take place. First, managers of an MPA must be able to effectively and consistently gather evidence. Likewise, there must be proper methods to collect evidence, even with the challenge of reaching vessels engaging in IUU practices in a timely manner. Effective enforcement on all fronts can be difficult to achieve, though rising developments in technology are promising, and personnel are developing the capacity to make a much larger impact than manned patrol vessels or individual data compilations. The most common method for protecting MPAs is through local

[153] PRCM. "New Means and Strategy for the Marine Surveillance of MPAs in the Bijagos Archipelago." West African Regional Maritime and Coastal Conservation Programme PRCM. 2010. http://en.prcmarine.org/index.php?option=com_content&view=article&catid=51%3Aactualit&id=920%3Anew-means-and-strategy-for-the-marine-surveillance-of-mpas-in-the-bijagos-archipelago&Itemid=226 (accessed Jan 26, 2012).

law enforcement efforts, considering that most existing MPAs are located within reach of local jurisdictions. Because of this, coastal MPAs are at present the most effectively enforceable. High seas MPAs do fall under critical enforcement priorities, but the expense of effective coverage is outweighed by the needs of coastal MPAs, which can be covered inexpensively and in a satisfactory manner.

There are other methods of enforcement that are not primarily seize, identify, or capture based. These enforcement methods focus on compliance and self-policing strategies. Following the proceedings of the 14th Biennial Coastal Zone Conference, it is shown that compliance is directly related to the balance between the anticipated payoff from a violation, likelihood of detection, and severity of penalties. However, many normative factors are also important determinants of compliance, including social pressures and the perceived legitimacy of management authorities and regulations.[154]

This chapter will discuss the types of surveillance currently being implemented in community-based MPAs, cross-regional MPAs, and high seas MPAs. Each MPA section will include information on the benefits and challenges of surveillance technologies available for each type of MPA, discuss feasible surveillance options for the MPAs of developing nations, and describe potential enforcement strategies. The latter section will present policy recommendations for each type of MPA. Recommendations will take the cost-effectiveness of surveillance technology and enforcement into account, as well as the concerns of stakeholders, and will

[154] Davis, Braxton. Proceedings of the 14 th Biennial Coastal Zone Conference, " ENFORCING U.S. MARINE PROTECTED AREAS: SYNTHESIS REPORT." Last modified July 25, 2005. Accessed January 31, 2012. http://www.csc.noaa.gov/cz/CZ05_Proceedings/pdf files/Davis.pdf.

provide a potential solution to the monitoring and surveillance problems facing developing nations' MPAs.

Surveillance of Community-Based MPAs

Community-based MPA monitoring is most commonly managed by local law enforcement. The law enforcement agencies of coastal developing nations primarily rely on manpower-intense methods of monitoring and enforcement. Manned patrol vessels, for example, are one of the most effective methods for coastal monitoring. This type of surveillance, however, requires a great deal of manpower, and patrol vessels vary in size depending on objective, sponsor, and nation. This is particularly difficult in reference to the MPAs of developing nations. Under the U.S. Coast Guard, Enforcement Officers earn an average annual salary between $38,000 and $70,000 USD.[155] Many developing nations lack the funds to support manned vessels operating at this cost per operator. Manned surveillance vehicles are also limited in their basic capabilities. Patrol boat monitoring is greatly limited by line of sight, and this is exacerbated under adverse weather conditions.

Enforcement methods relying simply on patrol vessels can become a major concern for MPAs with weaker infrastructure, especially when attempting to apprehend dangerous pirate vessels. It is not always necessary to board a vessel and restrain the vessel's captain and sailors, either on the high seas or in coastal waters, but it is immensely important that the work of enforcement officials is respected and legitimized officials are not intimidated by bad actors.

[155] Jones, Matthew. "Enforcement of U.S. Fisheries Laws in the EEZ: An Illustration of the Value of the Coast Guard's Deepwater Mission to the Nation and the Need to Provide it With Adequate Deepwater Resources." *Ocean and Coastal Law Journal*, 13 (2007): 281-307.

With the capacity to do so, some coastal MPAs will use low-tech aerial surveillance as a monitoring and enforcement mechanism. While the labor-intensity of this practice is an issue, it also has limitations similar to those of patrol vessels, such as maintenance, training, and weather conditions. Without access to the high-tech radar and imaging systems used by developed nations, aerial surveillance is largely ineffective and can be costly.[156] Enforcement is also a critical issue; the ability to see a perpetrator while airborne is only one facet of protection procedures. Besides being limited by manning and fleet size, this type of surveillance is severely limited by time of day and weather conditions. Developing nations typically do not have a supply of night vision technology to assist with nighttime surveillance, and patrol during inclement weather is rarely an option. Although coastal areas are the smallest of MPA areas, the size ratio to available labor is severely unbalanced and does not allow for truly effective surveillance.[157] Given the smaller scale of coastal MPAs, small UAs and UAs that require land-based transmission of data are perhaps more suitable surveillance options.

One of the strengths of small UAs is that many carry EO and SAR surveillance technology, which can provide near real-time surveillance due to their proximity to land stations, unlike many other monitoring information systems that require manual download or rely on delayed satellite communications. In a study by the Florida Cooperative Fish and Wildlife Research Unit, small UAs (aircraft whose wingspan is less than three meters) have proven effective in wildlife monitoring; this study also concluded that small UAs are best used for local surveillance of a 6-8 km average range.[158] Although UAs are not typically seen by fishing boats

[156] "Water Monitoring Buoy Systems." *Fondriest Environmental, Inc.* 11 Aug. 2010. Web. 02 Mar. 2012. <http://www.fondriest.com/news/watermonitoringbuoy.htm>.
[157] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 19: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.
[158] Jones, George P., Pearlstein, Leonard G., Percival, H. Franklin, "An Assessment of Small Unmanned Aerial Vehicles for Wildlife Research," *Wildlife Society Bulletin*, 34 (2006): 750-758.

or other vessels due to their small size, this is not necessarily detrimental to their success. As discussed in another section of the Florida report, the "boogeyman effect" of enforcement, i.e. the sensation and awareness that an unseen enforcement and/or monitoring method is being used, has very powerful results.

For short-term purposes, small UAs cost less, when all costs are considered, than manned patrol vessels. For instance, Barnard Microsystems Limited sells Dragon Eye UAs (small UAs with a wingspan of 1.1m and live video link up to 10km) in trios, with the required ground control and maintenance equipment included for approximately $100,000 USD.[159] The U.S. has also adopted the Raven UA as the standard short-range UA. Although its battery needs to be recharged after only 90 minutes, three unit systems cost only approximately $167,000 USD.[160] Developing nations could monitor their local and coastal MPAs using these small and inexpensive UAs, and cut down on labor and equipment depreciation costs of manned surveillance boats.

If developing nations employ small UAs, however, they must provide adequate training to operators and coordinate with law enforcement to ensure effective and successful monitoring. While the initial unit cost is one large sum in the short-run, UAs will accrue training, education, and maintenance costs over time. According to U.S. Customs and Border Protection estimates on UA use in border surveillance, the costs associated with operating a UA can be more than twice the cost of operating a manned aircraft.[161] However, MPA use of UAs may vastly differ from border patrol practices, and UAs serve as a valuable option for MPAs in combination with other surveillance methods.

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[159] AeroVironment Dragon Eye UAV." *Barnard Microsystems Limited*. 2012. Web. 02 Mar. 2012. <http://www.barnardmicrosystems.com/L4E_dragon_eye.htm>.
[160] U.S. Congressional Research Service. *U.S. Unmanned Aerial Systems.* by Jeremiah Gertler. Washington: 2012.
[161] U.S. Library of Congress. Congressional Research Service. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance* by Christopher Bolkcom and Blaz Nunez-Neto. Washington: 2008.

Though not necessarily an end-all solution for coastal MPA protection, UAs provide a viable long-term solution for expanding the range and ease of MPA coverage. UAs should be considered as a long-term monitoring option for MPAs once the funding is generated to support them. Incorporating UAs into future monitoring efforts requires developing nations to keep equipment and training programs – both for operators and analysts – up to date. The field of UAs is rapidly growing, as innovations and training requirements are continuously evaluated. Even after funding for UA technologies is available to developing nations, it will be necessary to consider the challenges of maintaining cutting-edge technology.

UAs have specific capabilities, but in their current iteration there are also constraints to the UA system and the operator's abilities. Depending on the type of UA, the degree of operator training necessary varies tremendously. For the Dragon Eye, manufacturers claim that only one week of training is necessary for users, but some small UAs, such as the FoldBat, can be difficult to operate for minimally trained users.[162] Developing nations using UA technology will have to continually receive training from UA experts from developed nations and/or the UA manufacturers. UAs in coastal areas must also consider airspace use, especially in concerns to public safety. The Florida Cooperative Fish and Wildlife Research Unit cautions inexperienced operators from remotely controlling UAs in highly populated areas, and encourages the use of multiple operators and collaboration between local and coast guard enforcement officials to minimize the danger UA operations pose to the civilian community.[163]

For monitoring efforts outside of coastal areas, small UAs like the Dragon Eye (which send data to land-based stations) cannot typically be employed in MPAs on the periphery of a flag state's EEZ or high seas MPAs since they would be operating too far from the land stations

[162] "AeroVironment Dragon Eye UAV." *Barnard Microsystems Limited*. 2012. Web. 02 Mar. 2012. <http://www.barnardmicrosystems.com/L4E_dragon_eye.htm>.
[163] Ibid.

to send back data. It is not outside the realm of possibility to conceptualize options, such as buoys or other stationary water-based stations which could act as landing points. However, monitoring these larger areas currently requires the use of more advanced UA systems.

In discussing surveillance technology options for coastal MPAs, one must not forget the need to integrate stakeholders and civilians. Increased investment in educating local community stakeholders is a necessary component of enforcing compliance in coastal MPAs. Education and community involvement is a key component of CBMRM, a management system that encourages integrated efforts between MPA administrators, local officials, and community stakeholders.[164] One of the primary suggested methods for engaging a community in MPA conversations is to create advisory groups to help inform MPA policy decisions; these advisory committees have been found to help sustain management and enforcement over time.[165] This method brings together fishermen, MPA management, local government and others in meetings to discuss, reform, and plan MPA management. Although advisory committees have proven beneficial for CBMRM, differential access to MPA resources creates a disparity between community groups. If a group of stakeholders feel that they will not benefit from serving on advisory committees, they are not likely to attend meetings. MPA management must ensure partnerships with community groups are mutually beneficial, exchanging information and insights from local groups for special access rights, compensation for lost job opportunities, and so forth.[166]

Surveillance of Large MPAs Located in EEZs

Monitoring the large expanse of cross-regional MPAs is a challenge for developing

[164] Ferse, Sebastian C.A. et al., "Allies, not aliens: increasing the role of local communities in marine protected area implementation," *Environmental Conservation*, 37 (2010): 24.
[165] Mascia, Michael B., "The Human Dimension of Coral Reef Marine Protected Areas: Recent Social Science Research and Its Policy Implications," *Conservation Biology*, 17 (2003), 631.
[166] Ferse, Sebastian C.A. et al., "Allies, not aliens: increasing the role of local communities in marine protected area implementation," *Environmental Conservation*, 37 (2010): 27.

nations. Like community-based MPAs, manned patrol vehicles and aerial surveillance are the most common types of enforcement in cross-regions, though this already limited surveillance is further inhibited by the size of EEZs and these MPAs. However, there are more advanced solutions available that do not entirely depend on a developing nation's capabilities. VMS and AIS are two of the most common monitoring systems used throughout larger EEZs.

The VMS program was launched by NOAA's OLE in 1988 and today over 5,000 vessels are equipped with VMS. The initial cost for a VMS unit ranges from $1,000 to $4,000 USD, and operating costs allow operators to monitor up to 500 boats for merely $1 USD per day per boat, barely 1% of the cost of aerial or marine surveillance.[167] VMS is an active system installed on commercial vessels that periodically relays GPS information to satellites which relay that information back to a ground station that monitors ships and their routes.[168] Limitations of this system include time gaps where information is not programmed to relay for periods of time, around two hours, which is a long enough period to allow MPA violations to occur. There is not an international agreement on implementation of the VMS system, which causes communication difficulties among different agencies and nations. However it is believed that because of agreements in place that call for the use of more cost-effective monitoring systems and continued demand for surveillance, more vessels will turn to VMS.

AIS is similar to VMS in that it is also a transponder system installed on ships with a similar cost, approximately $5,000 USD per unit. The information relayed by AIS, however, is much more comprehensive than that of VMS. AIS not only sends coordinates, but also speed, heading, and ship identification information to land based stations and other nearby AIS-

[167]"Vessel Monitoring System." *Sea Watch*. Web. 2 Mar. 2012. <http://www.seawatch.org/solution/vms_position_paper.php>.
[168] NOAA Office of Law Enforcement. "Leveraging Technology and teh Vessel Monitoring System (VMS)." NOAA. 19 Jan. 2012 http://www.nmfs.noaa.gov/ole/vms.html

equipped ships. AIS was originally developed to relay the necessary information to prevent sea collisions, and is now widely used for monitoring ship activity. Under SOLAS, large commercial vessels and all passenger vessels are required to install an AIS, while smaller vessels can voluntarily install a smaller sub-type of an AIS.[169] The main limitation to AIS is that most AIS systems provide only limited near-shore coverage, and are unable to give open ocean data. AIS receivers are land-based, thus there is no guarantee that vessels traveling the periphery of the MPA will be able to send their information over long distances. AIS's range is severely limited compared to VMS, which uses satellites.[170] However, ORBCOMM, a worldwide leader in providing and developing satellite communication technology, has recently found a solution to the range problems of AIS systems. An AIS system has been equipped with microsatellites that orbit low enough to the earth to work with AIS equipped vessels all around the world. ORBCOMM will launch 18 upgraded versions of these satellites mid-2012.

LRIT is a system similar to VMS, in that it uses similar equipment and also relies on satellites to function. LRIT is similar to AIS, as it is a designated IMO system used to broadcast location information to vessels in compliance with SOLAS. LRIT is a system that supplements other systems like VMS with its long range transmission abilities. However, while LRIT may complement other systems, it cannot communicate with them. There is no existing interface that integrates the information of various systems.[171] The communications of LRIT are also limited to the number of data receiving centers it can disseminate information to, and the amount of

[169] IMO. "AIS transponders." IMO International Maritime Organization. 2011. 4 Feb 2012. <http://www.imo.org/ourwork/safety/navigation/pages/ais.aspx>.
[170] "AIS ." *ORBCOMM Services*. N.p., n.d. Web. 17 Jan. 2012. <http://www.orbcomm.com/services-ais.htm>.
[171] "Long Range Identification and Tracking (LRIT) Overview ." *Navigation Center*. U.S. Coast Guard Navigation Center, n.d. Web. 22 Jan. 2012. <http://www.navcen.uscg.gov/?pageName=lritMain>.

communications it can send.[172]

EMS is another available on-board monitoring system, though it is still undergoing more intensive development and testing. The EMS system is a combination of video cameras and sensors strategically placed throughout the vessel to record fishing activities. The cameras begin recording the crew and their catch handling activities when hydraulic sensors are triggered, indicating fishing activity, and the sensors record information such as the weight and location of the catch. NOAA conducted a pilot study to "evaluate the utility of EMS as a means to monitor catch on a real-time basis in the Northeast ground fish sector fleet."[173] Since monitoring in that region was expected to change from federally funded to industry funded, NOAA used this study to compare EMS with human observer data and activity for accuracy and to compare cost-effectiveness. The SERMA report concluded that the cost of EMS is about "one third of the cost of an observer" ($150/day compared to $500/day) but implementing extensive EMS use could cost millions of dollars since installation can cost over $8,000 USD per vessel. Despite the relatively high cost of this system, it cannot send real-time data due to the immense amount of data collected on any given excursion. The data is manually downloaded once the ship returns to land.[174] The immense amount of detailed data EMS does collect can be useful in certain situations, but for the purpose of providing developing nations effective ways to monitor high seas MPAs, EMS is not the most beneficial or useful resource. This system is primarily used in developed nations monitoring the activities of fishing fleets.

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[172] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper : 7-8 surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.

[173] NOAA Fisheries Service. "Electronic Monitoring System Technology." A Pilot Study: Documenting and Estimating Catch on Commercial Fishing Vessels Using Electronic Monitoring System (EMS) Technology. 29 Feb. 2012. www.gmri.org/upload/files/EMS_Monitoring_Panel_Presentation.pdf

[174] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 3-4: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.

Despite the capabilities of VMS and the breakthroughs of AIS systems, developing nations cannot afford to purchase the equipment and contracts necessary to take full advantage of these systems' capabilities. ORBCOMM requires annual subscriptions from its customers, including governments, to access AIS data via satellite. VMS systems are also expensive, and are further limited by the number of flag States that comply with the rules of VMS and other international agreements.[175]

A less expensive technology available to support MPA monitoring activity involves buoys. There are three main types of buoys used to protect MPAs. The simplest type of buoy is used to indicate boundaries, zones, rules associated with that area (no-wake zone, speed limits, etc.). These are commonly found in coastal areas. Mooring buoys are used as anchoring points for vessels in areas commonly used for recreational activities. Instead of dropping an anchor to the ocean floor and damaging the ecosystems, vessels can tie themselves to these buoys.[176]

High tech buoys built for acoustic monitoring activity and buoys built to house AIS transponders are the most effective for use in larger MPAs. These buoys use the mooring principle but have been developed to convert wave energy into power that can be used to keep acoustic monitoring systems continuously activated. This is a major improvement from traditional buoy monitoring systems that required regular power system maintenance. Like other novel technologies, however, these systems are expensive, around $5,000 USD per buoy. The monitoring capabilities of a buoy have a relatively short range, and the number of buoys required for sufficient monitoring of large EEZ MPAs would be determined by the size of the MPA.[177]

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[175] "AIS ." *ORBCOMM Services*. N.p., n.d. Web. 17 Jan. 2012. <http://www.orbcomm.com/services-ais.htm>.
[176] Fonriest Environmental. "Water Monitoring Buoy Systems." Fondriest Environmental. 11 Aug 2010. 28 Jan. 2012. http://www.fondriest.com/news/watermonitoringbuoy.htm
[177] Ocean Power Technologies, INC.. "PB150 PowerBuoy." Ocean Power Technologies. http://www.oceanpowertechnologies.com/pb150.htm (accessed Jan 18, 2012).

NOAA is responsible for integrating AIS equipment with buoys; the organization decided to install AIS receivers on their offshore data buoys. The USCG also uses this technology to further their mission in maritime safety.[178] Once again, however, this type of technology is not easily accessible by developing nations for many of the same reasons associated with other technology. Therefore, developing nations concentrate on implementing alternative, feasible methods of monitoring and surveillance.

Interpretive enforcement is used as a compliance strategy in larger MPAs, and serves as the standard for ensuring high compliance on the part of stakeholders. Many individual sites will continue to rely on a high level of voluntary compliance; to accomplish this, increased efforts are needed in education and outreach, with an emphasis on communicating clear rationale for MPA regulations. Similar to education strategies at the coastal level, interpretive enforcement seeks to teach stakeholders to self-police to the MPA regulations. Fishermen, once they are knowledgeable of the regulations and the sanctions that can be imposed against them, will shy away from pursuing IUU or invading MPA zones. Recreational users of MPAs are also a serious danger to the environment, and education efforts on their part have shown success in reducing the impact of their activities.[179]

Another important method is data fusion, which brings together large amounts of information from different sources for analysis and presentation, and uses the results to make decisions. This can occur on several different levels, from relatively simple integration of sensor data (e.g. VMS or AIS) into a format that can be used by enforcement personnel, to multi-agency

[178] National Oceanic and Atmospheric Administration. "USCG/NOAA Automatic Identification System (AIS) on Dta Buoys and C-MAN Stations." *Sector Puget Sound Vessel Traffic Service*. United States Coast Guard, 26 Sept. 2004. Web. 17 Jan. 2012. <www.uscg.mil/d13/psvts/docs/aissrsfinal.pdf>.
[179] Davis, Braxton. Proceedings of the 14 th Biennial Coastal Zone Conference, " ENFORCING U.S. MARINE PROTECTED AREAS: SYNTHESIS REPORT." 25 July. 2005. 31 Jan. 2012. 2005.

data streams for national security purposes.[180] Data sharing, however, though similar in objective to data fusion, is complicated by legal limitations that restrict the free exchange of information between agencies. Information may be classified, personal or restricted, such as SERMA Technical Options VMS data. Although both guidelines and international agreements exist to facilitate multi-source data sharing, they are complex and mired in legal language.[181]

Strengthening partnerships and multilateral activities has also been shown to be an effective enforcement method. Since many MPAs are not located within the sole jurisdiction of one polity, it has been the inherent interest of enforcement professionals to ensure that partnerships exist and are strengthened. Examples include Kiribati's PIPA, which has a long-standing agreement with the USCG. The USA Kiribati Ship-riders Agreement (2008) illustrates the effectiveness of this agreement, whereby Kiribati Maritime and Fisheries Officers are able to travel on USCG ships and have the full power of vessel arrest and other related powers under Kiribati Law. This initiative has already proven highly successful with the impoundment and prosecution of a vessel caught illegally bunkering off Nikumaroro Atoll in PIPA (a $4.7 AUD million fine).[182] The coordination of the Bahamas with the Royal Navy of the U.K. and U.S. representatives to create the Royal Bahamian Defense Forces also illustrates such partnerships; such naval arrangements have been shown to be less costly than founding national navies.[183] Initiatives like these are examples where multilateralism can come into play: countries are usually amenable to multilateral agreements protecting MPAs if it is within their power to provide assistance at an inexpensive cost and within the parameters of international law.

[180] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 1: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.
[181] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 1: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.
[182] VanderZwaag, David L., and Paul MacNab, ed. Canada: International Union for the Conservation of Nature, 2009. s.v. "Marine Protected Areas: Legal Framework for the Gully off the Coast of Nova Scotia (Canada)."…
[183] Lockwood, John. Interview by Task Force. Seattle, WA, January 17, 2012.

Large MPAs within EEZs do not have the luxury of using small, inexpensive UAs like the Dragon Eye because of distance and data limitations. Under current conditions of UA technological cost-effectiveness, these MPAs require different types of UAs that have the surveillance capabilities necessary to effectively monitor large MPAs. Like in coastal MPA monitoring, UAs provide a cost-effective surveillance mechanism for large MPAs within EEZs. U.S. Homeland Security estimates that unit costs for manned aircraft can range anywhere from $8.6 million USD for a BlackHawk helicopter to $36 million USD for a P-3 manned aircraft, whereas UA unit costs range from $300,000 USD for relatively inexpensive Shadow UAs to $4.5 million for Predator UAs.[184] UA unit costs can even reach as high as $211 million for one Global Hawk.[185] However, a Global Hawk is an example of a UA with weapon capabilities that is not the type being examined in this report for use in MPAs. Further, vehicle costs are not the only UA-related costs to be considered. Land station costs are also significant, and long-term education and training will also require funding before UAs can be implemented. A Congressional Research Service report published in January 2012 describes UAs as "[o]nce…a cheap alternative to manned aircraft…some UAS are beginning to rival manned aircraft in cost." This is in reference to the $13.9 billion program implemented to obtain a new fleet of Global Hawks.[186] The Global Hawk is just one example of a UAS that could be used to monitor large MPAs. The Global Hawk can remain airborne for over 28 hours, be equipped with a variety of imaging sensors (EO, SAR, IR) and is also capable of providing near real-time FMV.[187]

[184] U.S. Library of Congress. Congressional Research Service. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance* by Christopher Bolkcom. Washington: 2004.
[185] U.S. Congressional Research Service. *U.S. Unmanned Aerial Systems.* by Jeremiah Gertler. Washington: 2012.
[186] U.S. Congressional Research Service. *U.S. Unmanned Aerial Systems.* by Jeremiah Gertler. Washington: 2012.
[187] Air Combat Command, Langley AFB, VA. "*RQ-4 Global Hawk*." U.S. Air Force. 27 Jan 2012. 27 Feb. 2012. http://www.af.mil/information/factsheets/factsheet.asp?id=13225

These UA technologies are effective as they carry EO sensors that provide high-resolution imaging which can "identify an object the size of a milk carton from an altitude of 60,000 feet."[188] Although EO technology can identify objects at great distances, it is most effective during daylight hours and the U.S. Congressional Research Service determined that EO sensors are subject to weather conditions and function poorly in both cloudy conditions and under high humidity.[189] Alternatives to EO include IR and SAR, each of which uses different technologies to produce images during adverse weather or when it is too dark to use EO sensors. Furthermore, the judicious deployment of UAs among a range of options provides opportunity for effective efforts and longer UA life spans.

Besides using UAs for imagery, NOAA's plans for UAs include employing them for wildlife assessment, fisheries law enforcement, monitoring coastal ecosystems, and using information gained to establish national ocean policy.[190] UAs are a valuable technology, and they have a wide range of applications. In 2007, the American Institute for Aeronautics and Astronautics recommended that Congress allot $90 million USD to NOAA for UA testing in Alaska to monitor global climate change, natural disasters, marine fisheries and state security.[191] Congress granted NOAA the funding for FY 2008, but not all developing nations have the financial capacity to allot this significant amount to UA research, development and implementation. Although unmanned aircraft can be less expensive than manned aircraft, some developing nations still will not be able to afford these technologies.

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[188] U.S. Library of Congress. Congressional Research Service. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance* by Christopher Bolkcom. Washington: 2004.
[189] U.S. Library of Congress. Congressional Research Service. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance* by Christopher Bolkcom and Blaz Nunez-Neto. Washington: 2008.
[190] Hood, Robbie. *Webinar Presentation: NOAA Unmanned Aircraft Systems Program Overview.*27 Feb. 2012. http://http://uas.noaa.gov/rfp/WebinarPresentation.pdf
[191] American Institute for Aeronautics and Astronautics. 2007. *Critical Need for Investment in Unmanned Aircraft Systems (UAS) Within the National Oceanic and Atmospheric Administration (NOAA)*.

Bilateral agreements between developed and developing nations should be created to share advanced surveillance technology. According to the Teal Group's *World Unmanned Aerial Vehicle Systems: 2011 Market Profile and Forecast*, between 2011 and 2020 the world will produce a total of approximately 27,000 UAs of all sizes for intelligence, reconnaissance, and surveillance purposes, and the United States alone will procure $36.5 billion USD worth of UAs, compared to only $19.4 billion USD by the rest of the world.[192] Developing nations should consider partnering with developed countries, such as the United States, to decrease procurement costs and guarantee access to UAs in an increasingly competitive market. Similar to the Kiribati-U.S. agreement to allow Kiribati officials on U.S. Coast Guard vessels, partnerships can be created to ensure surveillance technology is more affordable and accessible for developing nations.

MPA management can consult international NGOs such as the AUVSI, which unites 60 member nations across the world in an effort to help shape legislation surrounding the development of unmanned robotics and technology.[193] The U.S. Department of Homeland Security states that one possible legal matter that must be addressed is granting airspace rights to partner nations for monitoring and surveillance.[194] The Teal Group stresses that until the airspace issue is resolved, the commercial, non-governmental UA market will emerge much more slowly than the governmental market, making UAs only a future option for private MPA monitoring and surveillance.[195] UA surveillance of large MPAs within a flag state's EEZ is a possible cost-

[192] Zaloga, Steven J., Rockwell, David, Finnegan, Philip. "World Unmanned Aerial Vehicles: 2011 Market Profile and Forecast." Teal Group Corporation: Fairfax, VA.
[193] "Advocacy," Association for Unmanned Vehicle Systems International. 26 Feb. 2012. <http://www.auvsi.org/…
[194] U.S. Library of Congress. Congressional Research Service. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance* by Christopher Bolkcom. Washington: 2004.
[195] Zaloga, Steven J., Rockwell, David, Finnegan, Philip. "World Unmanned Aerial Vehicles: 2011 Market Profile and Forecast." Teal Group Corporation: Fairfax, VA.

effective monitoring mechanism that should be considered in the future by developing nations.

Surveillance of High Seas MPAs

Developing nations' ability to monitor high seas MPAs is limited, if not non-existent. The funding and resources required to effectively monitor the high seas is beyond the scope of what developing nations can do. What can be done, however, is work with developed nations who do possess the means to monitor the high seas. Many developed nations have the high tech equipment necessary to protect MPAs, including satellites, sensor technologies, and other previously mentioned technologies such as AIS, VMS, and buoys. This section will discuss the available technology and how developed nations have successfully used technology to enforce the laws of high seas MPAs.

Aircraft

Aircraft used for monitoring MPAs range from small aircraft with minimal surveillance equipment monitoring coastal areas, to aircraft equipped with the most advanced imaging systems to protect high seas MPAs. Aerial surveillance also provides a wider range of visibility when compared to ships whose range of view is limited by the horizon.[196] Some problems associated with simple aerial surveillance are the limited visibility in adverse weather conditions, costs of maintenance and operation, and the aircraft's limited range and mileage.[197]

Larger aircraft have the advantage of being able to stay airborne for longer periods of time than small aircraft, allowing them to cover more area. This makes these aircraft ideal for

[196] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 15: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.
[197] Ibid.

monitoring MPAs on the high seas. However, effectively monitoring every MPA in the open ocean would require a large amount of aircraft, manpower, and technology. Continuously monitoring every MPA with aircraft is not cost-efficient, but advanced imaging technology can make their airborne time more worthwhile.

Surveillance aircraft can carry a variety of sensors, each with its own advantages and disadvantages. EO sensors, for example, provide color or black and white imagery similar to that of an everyday camera, but the sensor's ability to capture violators is severely limited as EO only works in daylight, and adverse weather conditions make it near impossible to provide clear imagery. Solutions to these visibility limitations include IR sensing, SAR, and SLAR. Infrared sensors use heat to produce imagery while SAR uses radar pulses to produce imagery. SLAR radar has a substantial range of 80 km, making this an effective instrument for long range surveillance.[198]

Unmanned Aircraft

Unmanned aircraft systems (UAS) are "system[s] whose components include the necessary equipment, network, and personnel to control an unmanned aircraft," according to the U.S. DOD's *Dictionary of Defense*.[199] More specifically, unmanned aerial vehicles are "powered, aerial vehicles that do not carry a human operator, use aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload."[200] UA are flexible, cost-efficient, and effective

[198] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 9: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.
[199] U.S. Department of Defense. *Dictionary of Defense*. 27 Jan. 2012. http://www.dtic.mil/doctrine/dod_dictionary/data/u/18956.html.
[200] U.S. Library of Congress. Congressional Research Service. *Unmanned Aerial Vehicles: Background and Issues for Congress.* by Elizabeth Bone and Christopher Bolkom. Washington: 2003.

surveillance technology that can be used to monitor MPAs. However, given current financial constraints facing developing nations, UAs are primarily an option that is feasible in the long-run after a strong ground support and stable infrastructure are established and adequate funding is generated to support all the expenses included in operating UA missions. UAS are a viable surveillance method comparable to other existing technology like VMS, Satellite imaging, and manned aircraft.

Currently, UAs are used more widely in military operations, border security, and other areas of defense than in environmental and conservation monitoring efforts. MPA management can learn from these other types of UA operations and employ UAs to monitor illegal fishing and vessel patterns in the future. With the wide range of sizes and types of UAs from less than three meters in length to the size of a commercial passenger airplane, UA monitoring must cater to the different needs of coastal MPAs, large MPAs within flag State EEZs, and MPAs on the high seas. Surveillance and monitoring efforts in MPAs fulfill a different role and priority than military or policing operations, and therefore need to be considered according to the specific needs of MPAs, the ways in which UAs are being used, and the ways in which they will be used in the future.

Current applications for UAs in the United States for the purposes of maritime surveillance and monitoring are those being pursued by the USCG, which seek to improve upon MDA "by providing persistent, wide area surveillance MDA, a central Coast Guard operational concept, [which] refers to the effective understanding of anything associated with the maritime domain that could impact the security, safety, economy, or environment of the United States."[201]

[201] United States Coast Guard, "Unmanned Aircraft Systems Features." Last modified January 26, 2012. Accessed March 2, 2012. <http://www.uscg.mil/acquisition/uas/features.asp>.

This report seeks to improve the MDA of developing nations so as to improve protection of currently existing MPAs.

UAs, like other surveillance technologies used in large EEZs, can be used in high seas MPAs because they are able to monitor large remote areas. UAs are even more applicable to high seas MPAs located a considerable distance from land-based surveillance and enforcement, as UAs are capable of traveling long distances and can monitor areas continuously for hours. According to NOAA's Marine Protected Areas Technology Assessment Report, remote areas could use UA automated drones instead of remotely controlled vehicles, preventing any possible operator complications over long distances.[202] However, until further testing and experimentation is undertaken, UAs will continue to be difficult to implement, especially with unforeseen constraints. Drones, for example, require very fine-tuned technology to ensure survivability and effectiveness.

The current maritime surveillance and monitoring efforts regarding UAs in the United States are through the USCG, which is seeking to use UAs for the purposes of national security and maritime security missions. According to the USCG:

> "Tactical, cutter-based Unmanned Aircraft Systems would augment the operational effectiveness of Coast Guard cutters by extending a cutter's surveillance horizon. The Coast Guard is studying the most effective classes of UASs to operate from the National Security Cutter (NSC), an advanced capability vessel that uses onboard sensors and partnerships with manned and unmanned aircraft to support a significantly expanded surveillance range…Additionally, the Coast Guard is studying tactical, long range land-based UASs that would provide long endurance surveillance capability comparable to those of Coast Guard manned fixed wing aircraft."[203]

[202] NOAA Coastal Services Center. "Marine Protected Areas Technology Needs Assessment." NOAA. Dec. 2003.
[203] United States Coast Guard, "Unmanned Aircraft Systems Features." 26 Jan. 2012. 2 Mar. 2012. <http://www.uscg.mil/acquisition/uas/features.asp>.

Scholar Jaysen Yochim of the U.S. Army Command and General Staff College discusses the technical limitations of UAs being used for military purposes as follows:

> "Unmanned systems also have some disadvantages when compared to manned aircraft. They are still prone to human error due to their being flown by ground based operators. Their development and procurement cost has grown exponentially as capabilities increase. Current systems are not autonomous and their control is contingent on uninterrupted communications. Their dependence on a constant control signal has contributed to a UAS accident rate 100 times greater than manned aircraft. A threat could exploit this need for an uninterrupted data feed by using Electronic Warfare to disrupt this signal, potentially crippling unmanned systems."[204]

Though the opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency, the problems raised are important deterrents for developing nations attempting to utilize UAs as a cost-effective monitoring alternative. It is not outside the range of possibility that UAs in their current form could be subject to electronic signal disruptors, though it is an uncommon risk. Furthermore, in military applications UAs are not as judiciously used as they could be, which explains their high accident rate. If properly operated, UAs are capable of performing tasks for a long period of time before losing their capacity. The benefits of using UAs in some situations outweigh the negatives, thus UAs are a viable long-term tool for MPA surveillance as the field continues to change rapidly.

Satellites

Satellites are used in many aspects of environmental conservation, especially those concerning the ocean. Satellite images can provide researchers with data ranging from water temperature to shoreline changes.[205] Imaging sensor technology allows satellites to capture

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[204] Yochim, Jaysen. *THE VULNERABILITIES OF UNMANNED AIRCRAFT SYSTEM COMMON DATA LINKS TO ELECTRONIC ATTACK*. Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, 2010. 27 Feb. 2012. <http://www.fas.org/irp/program/collect/uas-vuln.pdf>.

[205] Satellite Imaging Corporation, "SENTINEL-3 ESA'S NEXT GENERATION SATELLITE SCHEDULED TO LAUNCH IN 2013." 29 Sept. 2009. 3 Mar. 2012. http://news.satimagingcorp.com/.

images anywhere in the world, including MPAs in EEZs and the high seas. Businesses such as Satellite Imaging Corporation, Geoimage, and Ocean Imaging are capable of providing these products. However, these products come with certain limitations and expenses.

The quality of the image will depend on the platform used to capture the image. Each satellite has unique capabilities (sensor type, resolution, orbit, channel wavelengths, etc.) that will need to be taken into account when considering purchasing satellite imagery. One of the most advanced satellites to date is the GeoEye-1 which has a spatial resolution of 16 inches.[206] This satellite is capable of revisiting the same spot on the earth every 3 days and is used by satellite imaging companies throughout the world. This type of technology is capable of providing MPAs with imagery of vessel locations and date/time information to support investigations of MPA violations. Because of the wide variety of sensors and technology available, satellites are not constrained by inclement weather or natural disasters, which makes satellites all the more useful in providing imagery. However, imagery does come at a cost. According to NASA and other data reporting agencies, a satellite image costs on average $4,000 USD. This cost can vary depending on the sensor that is requested as well as the size and location of the target area, but this cost alone is enough to deem continuous satellite imagery alone an ineffective method to monitoring MPAs.

Satellite Dependent

Most types of surveillance and monitoring technology rely on satellites in some way. Many active and passive buoy systems rely on satellites to relay information to their land-based counterparts and analysis stations. Imaging technology (EO, IR, Radar) requires satellite usage to send imagery back for analysis. An alternative, though slower way to download the imagery and

[206] GeoEye Inc.. "GeoEye-1." About GeoEye-1. 29 Feb. 2012. http://launch.geoeye.com/LaunchSite/about/ (accessed February 29, 2012).

information from the sensor pods is done manually when the aircraft returns to land, but this is disadvantageous when real-time information is needed. Satellites may not always be able to relay real-time imagery because of the source and size of the information, but it is faster than a manual download and they do have the capacity to cover large portions of the ocean while relaying relevant data for use at a later time. This easy accessibility to evidence is highly valuable when building cases and prosecuting criminals.

Satellites themselves also serve as imaging platforms. Satellites orbit the earth and cover massive amounts of area. The sensors on satellites are powerful enough to capture MPA violators, but for real-time usage, satellites are an unfeasible method. It takes a tremendous amount of time to download satellite imagery and analyze it. There are also gaps in satellite coverage. Although satellites have the capacity to cover most of the earth at one time, they orbit in a predetermined path unless programmed otherwise. This does not mean satellites cannot be sent to watch over a certain area, it only means real-time capability is limited.[207]

High Seas Enforcement Case Studies

Federal/Regional Cooperation

Under the advent of U.S.A. Executive Order 13158, the National Marine Protected Areas Center is charged with facilitating the effective use of science, technology, training, and information in the planning, management, and evaluation of the nation's system of MPAs as an attempt to unite policy and standardize action across the wide spectrum of national MPAs. Under this umbrella organization of policy and implementation recommendations, progress has been made in analyzing different methods of enforcing MPA protection in the USA. This system

[207] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 14: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.

provides an excellent framework for MPA protection in other nations, as it has produced aggregate reports analyzing the situation in US territorial waters. As US territorial waters are vast, representing a wide variety of regions and unique environments, comparing such efforts on an international scale may be highly beneficial.

One method used by Canada to reduce enforcement expenditures is to employ contractors to fulfill missions, as opposed to seeking government funding. Provincial Aerospace is a Canadian based company that provides airborne support for government, military, and industry missions worldwide. As commercial contractors, they are not dependent on governmental appropriations for funding support, and can maintain the newest sensor technologies, data management systems, training tools, and aircraft. Canadian governmental agencies have used this company for maritime surveillance, and maintain legal requirements for prosecution by assigning federal enforcement personnel as passengers on each mission. This is not a standard international model, but has been effective for Canada in covering its extensive coastal and high seas MPA territories.[208]

Solutions for High Seas Illegal Fishing Challenges: A Case Study

One effective solution for addressing illegal fishing concerns is France's use of both satellite images and VMS triangulation to implement targeted patrols. In this method, French authorities direct patrol craft toward suspicious or non-cooperative vessels by cross-referencing SAR image data with VMS data, and timing on-site enforcement patrols to coincide with satellite passes. Such specifically targeted patrols have greatly increased the perceived effectiveness of enforcement efforts, resulting in a sharp decline in illegal fishing activity; the mere threat of

[208] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 1: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.

enforcement has improved compliance.[209] This method counteracts the challenges faced by VMS tampering by converging satellite data. GPS can be accessed from almost any location, and has immense amounts of utility at little-to-no cost to the data consumer. Furthermore, GPS has improved success rates due to its ability to cheaply gather data and cross-apply it with other sources to establish a clearer picture. Such a multifaceted approach is required, as VMS or satellite imagery alone is not sufficient.

The concept of implementing the "boogeyman" of enforcement is crucial in promoting effective and inexpensive enforcement strategies. Sometimes only the perceived threat of being caught is enough to deter a potential poacher, which is a highly effective strategy that has been used in fields throughout public law enforcement; the very threat of repercussions prevents violations. Therefore, it is tremendously important for high seas enforcement to produce a fear of enforcement possibilities, as this reduces the need for actual enforcement activity to occur. Within this reputation-building system, a publicity campaign that educates fishermen should be implemented, focusing on awareness of the repercussions of breaking the law, and of the surveillance and enforcement efforts in place to catch violators.

Broader VMS data sharing between flag States is also a necessity. Such cooperation is a proven and effective method for triangulating invasive vessels. If not through U.N. coordination, increased implementation of multilateral data sharing is key, for high seas MPAs lay predominantly outside the sole jurisdiction of any one flag State, and within international jurisdiction.

[209] Davis, Braxton. Proceedings of the 14 th Biennial Coastal Zone Conference, " ENFORCING U.S. MARINE PROTECTED AREAS: SYNTHESIS REPORT." Last modified July 25, 2005. Accessed January 31, 2012. http://www.csc.noaa.gov/cz/CZ05_Proceedings/pdf files/Davis.pdf.

Concluding Policy Recommendations

The following tables summarize the above policy considerations per surveillance technology. These considerations must be taken into account when deciding which type(s) of surveillance to use in different MPAs.

Monitoring and Surveillance Technology Considerations (1)					
Surveillance Technology	**Weather**	**Day/Night**	**Alert System**	**Response Time**	**Location**
Aircraft: Large, High-Tech	Any	Day/Night	Data-based	Varies	High Seas
Aircraft: Small, Low-Tech	Clear conditions	Day	Varies	Varies	Coastal
AIS	Any	Day/Night	Data-based	0.5-1.5 hour delay	EEZ + High Seas
Buoys: Acoustic	Any	Day/Night	Data-based	Near real time	Coastal, EEZ, High Seas
Buoys: Mooring	Any	Day/Night	N/A	N/A	Coastal, EEZ, High Seas
EMS	Any	Day/Night	Data-based	Manual download	High Seas
LRIT	Any	Day/Night	Data-based	2 hour delay	EEZ + High Seas
Patrol Vessels	Clear conditions	Day	Eye witness	Near real time	Coastal
VMS	Any	Day/Night	Data-based	2 hour delay	EEZ + High Seas

Monitoring and Surveillance Technology Considerations (2)				
Surveillance Technology	**Secure Communications**	**Land Base Needed?**	**Manpower***	**Training Needed?****
Aircraft: Large, High-Tech	Needed	Yes	High	High
Aircraft: Small, Low-Tech	N/A	Yes	Low	Low
AIS	Needed	Yes	Low	High
Buoys: Acoustic	Yes	Yes	Low	Low
Buoys: Mooring	No	No	Low	Low
EMS	No	Yes	Low	High
LRIT	Needed	No	Low	High
Patrol Vessels	N/A	Yes	High	Low
VMS	Needed	No	Low	High
* - High = manpower-intensive monitoring strategy; Low = minimal manpower needed monitoring strategy ** - High = higher education, degrees, etc. needed to operate and interpret technology; Low = minimal training needed to operate technology				

Figure 10: Technical considerations for monitoring and surveillance technology.[210]

Based on the aforementioned considerations, we recommend the following actions.

Coastal MPAs

- Develop funding for greater creation of vessel patrol jobs. Different funding methods are discussed in the Funding chapter. By increasing funds for vessel patrolmen, MPA monitoring will be more financially affordable, and smaller MPAs will not have to buy

[210] Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper : 3-4 surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.

new surveillance equipment. Local community members should be hired for patrol vessel monitoring.

- Use CBMRM to engage local community stakeholders for sustainable monitoring practices. Create advisory committees from all stakeholders, hold meetings and conduct surveys to obtain input from all groups. Present committees with the Monitoring and Surveillance Technology Considerations, and ask for recommendations to be made based on their stakeholders' needs. Use these consulting groups for cost-cutting strategies, by employing their stakeholders in monitoring and enforcing the MPA.

- Buy mooring buoys to mark off MPA boundaries. This recommendation is for smaller MPAs where simply demarcating boundaries can discourage illegal entrance. This strategy should be complemented with increased patrol vessels to alert MPA enforcement in case of a violation.

- Create education, media, and publicity campaigns targeted at local stakeholders to teach MPA rules and regulations. This can begin in stakeholder committee meetings, and later as a strategic publicity plan developed based on stakeholder input.

Large MPAs in EEZs

- Take advantage of agencies and NGOs offering free or low cost equipment for VMS and AIS systems, such as Marinetraffic.com, which urges areas with limited AIS coverage to set up a connection with the website's receivers. Work with the local communities and funding sources to establish terrestrial AIS stations to implement full coverage of EEZs.

- Establish partnerships with developed nations to share satellite-based AIS systems. Nations already possessing ORBCOMM contracts should aid developing nations in protecting their EEZ MPAs, by creating a beneficial monitoring relationship and alert system. Developed nations can help monitor developing nations' waters through satellite imagery.

- Establish data sharing relationships between developed and developing nations. These relations are essential when aiding developing nations with high-tech equipment and training, such as acoustic monitoring buoys, VMS, and AIS systems.

- Create education, media, and publicity campaigns targeted at local stakeholders to inform them of MPA rules and regulations under the interpretive enforcement model. Education campaigns can be modeled after campaigns in coastal MPAs, but must be adjusted to a larger scale.

High Seas MPAs

- Implement the aforementioned EEZ policies, as these policies cover the monitoring of large areas, such as EEZs and the open ocean.

- After the establishment of developing-developed nation partnerships, developed nations must cooperate with developed nations when satellite imagery, aerial surveillance imagery, and other technologies are required in a criminal investigation. Such partnerships will be more cost-effective than developing nations individually signing contracts, or individually attempting to acquire and utilize modernized aircraft and sensors.

Appendix I: UA Technology Considerations

Small UAs for Coastal MPAs[211]

	Response Time	Flight time	Sensor	Cost ($ USD)	Training	Secure Communications	Range (NM)
Dragon Eye	**Real-time**	**45 minutes**	**Video, IR, EO**	**154,000**	**Low**	**Land-based station**	**2.5**
Pointer	**Real-time**	**2 hours**	**IR, EO**		**High**		
Raven	**Real-time**	**90 minutes**	**IR, EO**	**56,000**	**Low**	**Land-based station**	
Scan Eagle		**20 hours**	**IR, EO**	**100,000**	**High**		**60**
STUAS			**Video, IR**		**High**		**50**

UAs for Large MPAs in EEZs and High Seas MPAs[212]

	Response Time	Flight Time (hours)	Sensor	[Avg] Cost (millions $ USD)	Training	Secure Communications	Range (NM)
Predator	**Real-time**	**24**	**Video, IR, EO, SAR**	**4.5**	**High**	**Satellite, Land-based station**	**500**
Grey Eagle		**36**	**IR, EO**	**114.1**	**High**	**Satellite, Land-based station**	
Reaper		**32**		**26.8**	**High**	**Satellite, Land-based station**	**2000**
Global Hawk		**35**	**IR, EO, SAR**	**140.9**	**High**	**Satellite**	**5400**
BAMS	**Real-time**		**IR, EO**	**55**	**High**	**Satellite**	**2000**
Fire Scout		**9.5**	**IR, EO**		**High**		

[211] U.S. Congressional Research Service. *U.S. Unmanned Aerial Systems.* by Jeremiah Gertler. Washington: 2012.
[212] Ibid.

Chapter 4: Funding – The Costs and Maintenance Associated with MPAs

Genesee Rickel, Christena Berner, and Dustin Dacuan

Chapter Summary

Key Policy Considerations

MPAs suffer from a lack of adequate funding in many developing regions. Most MPAs are unable to achieve their conservation objectives because they cannot adequately fund monitoring and enforcement efforts. Without the capacity to enforce laws within MPAs, many protected areas, in the developing world in particular, are little more than 'paper parks.' MPAs should employ a variety of funding strategies to generate the income necessary for conservation work; a number of potential strategies will be outlined in this section.

Background

MPAs currently lack funding to cover every day operation costs, let alone monitoring and enforcement costs. MPAs in the developing world have unique funding challenges. Because these governments generally have lower GDPs in comparison to more developed nations, they cannot afford to invest as much time, resource, or money into the management of their protected areas. Only some MPAs use volunteers from stakeholder groups to help reduce costs, run operations and/or help with monitoring and enforcement. MPA networks are also underutilized because they require regional political will and legislation that is difficult to establish in many developing nations. User fees are typically lower than the actual customer's willingness to pay, especially in high-volume diving areas. Large-scale funding mechanisms, through Internet social media and international financing institutions, are also underutilized.

Policy Considerations

MPAs of developing nations need to improve their funding strategies in order to effectively enforce conservation measures and ensure long-term sustainability. MPA managers in the developing world face a variety of constraints when it comes to procuring adequate funding and often cannot secure funds from their local governments. Additionally, they are often understaffed, and they must take into consideration the interests of a variety of stakeholders when it comes to choosing funding strategies. The recommendations outlined in this chapter were chosen because they are feasible to implement under these constraints. To address the issue of limited government funding, endowments should be created to cover management and operation costs; these are the most permanent funding sources. All MPAs need to conduct WTP studies to determine the highest willingness to pay and then use the results of these studies to implement maximum user fees and to set up their fee structures. These studies can be informal and inexpensive, and are feasible under the budget and staffing constraints of MPAs in the developing world. Stakeholders should be consulted during the fee decision-making process. To combat the problem of understaffing, coastal MPAs also need to consult stakeholder organizations and local communities to recruit volunteers. Regional MPA networks should be established so that self-financing MPAs may subsidize MPAs that cannot generate sufficient funds on their own. Regional legislation will be difficult, due to the fact that local authorities may be reluctant to cede power to a higher authority, but successful networks such as the California MPA network can be used as guidelines. MPA networks should seek funding from large, international donor institutions such as the World Bank, Asian Development Bank, and the Inter-American Development Bank. Microfinancing should be used for short-term financial

gains, and crowd source funding sites, such as the Kiva and Kickstart models, should be created to increase awareness about the needs of MPAs and generate long-term funding.

Key Recommendations

- Create long-term endowments in all coastal MPAs and high seas MPAs to cover management and operations costs.
- Conduct willingness to pay studies in all MPAs to determine highest WTP. Use study results to determine fee structure.
- Utilize volunteers in local MPAs to reduce labor costs.
- Create crowd-source funding websites under the Kickstart model to generate Internet funding.
- Create local, regional and national MPA networks to share funding revenues.

Introduction

Insufficient funding of MPAs is jeopardizing the conservation efforts necessary to protect important marine ecological regions. The current average income of MPAs only meets about half the annual costs required to sustain them[213]. This insufficient ratio of income to spending leaves a debilitating disparity between the funds collected for MPAs and the cost to sustain them. Out of 83 MPAs polled in a combination of 18 different studies, only 15.7 percent reported that their funding was sufficient to effectively conserve the ecosystems within their MPA.[214] Lack of funding stems mainly from lack of political will. Further, increased costs in improving the monitoring and enforcement efforts for MPA protection demands a reconsideration of funding collection methods to secure long-term financial stability. MPAs have three main costs: management, monitoring, and enforcement; these costs combined highlight the urgency to re-examine funding methods to secure both short-term and long-term sustainability.

Management

Day-to-day operations of an MPA consist of monitoring the ecological progress of the MPA as well as monitoring threats including overfishing, climate change, and ocean acidification. Monitoring and enforcement concerns primarily involve human interactions with MPAs. The goal is to protect the enclosed environment by monitoring possible infractions. The following describes the costs associated with the management operations of MPAs.

[213] Balmford, Andrew, "The worldwide cost of marine protected areas," *Proceedings of the National Academy of Sciences*, 101 (2004): 9694.
[214] Peters, H., and J.P. Hawkins. 2009. "Access to marine parks: A comparative study in willingness to pay". *Ocean and Coastal Management.* 52 (3-4): 219-228.

Day-to-Day Operations

Some recurrent daily costs include on-site administration, staff salaries, and maintenance, among others. Initial costs necessary to fund an MPA include user permits, biological inventories, and construction. Differing MPA objectives, including active ecosystem management and restoration, wilderness protection and/or the promotion of sustainable use, can require more intensive funding. Day-to-day operations are also dependent on MPA size. In a USAID study of six MPAs in the Philippines ranging in size from coastal to large EEZ, total operation costs were approximately 1,164,304 Philippine pesos or $27,396 USD per year (excluding monitoring and enforcement costs).[215] Due to economies of scale, management costs per hectare actually decrease as the size of the protected area increases.[216] A comprehensive study of 89 MPAs worldwide concluded that the total annual cost of MPAs decreases the farther an MPA is from inhabited land; these MPAs tend to be larger.[217] Regular operation costs of MPAs are also dependent on political ties, national and local administration, and other activities necessary to support the MPA global network. All such costs vary across nations.

Ecological and Socioeconomic Management

Ecological management monitors the biological and environmental state of an MPA, whereas socioeconomic management monitors the human interactions with an MPA, including tourism patterns, vessel trespassing, overfishing, and so forth.[218] Ecological management begins

[215] Toribio, Maria (USAID). *Cost-Benefit Study of Marine-Protected Areas: Implications of Financing and Institutional Needs*. The Philippines.
[216] Bruner, Aaron G., Gullison, Raymond E., and Balmer, Andrew, "Financial Costs and Shortfalls of Managing and Expanding Protected-Area Systems in Developing Countries," *BioScience*, 54 (2004): 1119.
[217] Balmford, Andrew, "The worldwide cost of marine protected areas," *Proceedings of the National Academy of Sciences*, 101 (2004): 9695.
[218] Wilkinson, Clive et. al., *A practical guide on how monitoring can support effective management of MPAs*, Australian Institute of Marine Science, 4-7.

with a baseline study of the MPA, and determines if further resource assessments are necessary. Advanced scientific techniques and GIS technology can be employed to most accurately measure activity in the MPA with satellite and/or aerial photography. However, these technologies are very expensive and are more feasible for developed nations to adopt. Ecological studies in an MPA are conducted every one to three years, depending available resources. There are three specific types of monitoring for coral reef MPAs: community monitoring by local volunteers and businesses, management monitoring by government groups, universities and research institutions and scientific monitoring by researchers.[219] All of these ecological studies help determine what is environmentally at stake in the development of MPAs.

Conversely, socioeconomic management measures human interactions with MPAs. Socioeconomic management helps determine who exactly is using the MPAs, the patterns of their use, and the benefits they receive from the MPA. This management can also help determine the community's knowledge about the MPA. Current management practices need to be reviewed because disorganized socioeconomic management and monitoring has been cited as one of the most common factors for the financial failure of MPAs.[220] Some such management includes the MPA tourism industry and the role of the local community in coastal MPAs. Tourism has proven worldwide to be a lucrative funding source for MPAs. The Great Barrier Reef Marine Park in Australia, for instance, brings in $5.5 billion in annual revenues and has created 54,000 jobs, totaling thirty-five times the value of the national fishing industry.[221] Further, MPAs in the Philippines are currently reviewing dive tourism practices, and estimate that the implementation of a user fee system in areas of high dive tourism would allow for the collection of up $1 million

[219] Christie, P., White, A.T., "Best practices for improved governance of coral reef marine protected areas," *Coral Reefs*, 26 (2007): 1049.
[220] Wilkinson, Clive et. al., *A practical guide on how monitoring can support effective management of MPAs*, Australian Institute of Marine Science, 4-7.
[221] Sala, Enric. Interview by Task Force. Videoconference. Seattle, WA. January 10, 2012

(USD) annually. Researchers argue that this user fee funding could sustain maintenance of regional MPAs and provide job opportunities for those fishermen negatively impacted by MPAs.[222] Studied aspects of tourism include visitor numbers, tourist use patterns, patron views on MPAs and willingness to donate funds to MPA management. The role of the coastal community comes into play in negotiations between local government, ports, and fisheries.

Long-term sustainability of management and operations can require local political agreements, and in some cases, public-private partnerships. These partnerships can help raise funds from government sponsors, private donators, corporate sponsorships, and even environmental taxes.[223] High seas MPAs though require international attention for sufficient funding. Both state and international assistance are limited; therefore many financially stable MPAs do not rely solely on government aid.[224] The range of funding sources must be utilized to accrue sufficient and sustainable funding for MPA management and operations. In addition, MPA management must not only raise the financial means to identify and measure to what degree these threats are impacting MPAs, but must also combat their effects. It is imperative to close the funding gap to ensure the success and sustainability of MPAs worldwide.

Monitoring and Enforcement Costs

Monitoring equipment and enforcement systems are very expensive for developing nations to afford and maintain. For coastal MPAs, coast guards and local authorities are employed in monitoring efforts. However, for high seas MPAs, surveillance monitoring becomes

[222] Fabinyi, Michael, "Dive tourism, fishing and marine protected areas in the Calamianes Islands, Philippines," *Marine Policy*, 32 (2008), 899.
[223] Svensson, Patrik, Rodwell, Lynda D., and Attrill, Martin J., "Privately Managed Marine Reserves as a Mechanism for the Conservation of Coral Reef Ecosystems: A Case Study from Vietnam," *Ambio,* 38 (2009): 72.
[224] Reid-Grant, Kimesha and Bhat, Mahadev, "Financing marine protected areas in Jamica: An exploratory study," *Marine Policy*, 33 (2009): 129 – 130.

much more difficult and expensive. Advanced surveillance technology is used in large MPAs within nations' EEZs, and in high seas areas to monitor human activities. This technology is especially effective in monitoring commercial fishing—the single greatest threat to remote marine ecosystems.[225] Monitoring efforts need to be re-examined and customized for each size of MPA, in order to implement the most cost-effective methods of protection.

Coastal MPAs

As discussed in the Monitoring and Surveillance Chapter, the most inexpensive and commonly used surveillance mechanisms in coastal MPAs are manned patrol boats. Patrol vessels are labor-intensive, but the technology used on the vessels to survey the area is sometimes as basic as a pair of binoculars. The number of patrol vessels necessary for monitoring purposes is dependent on the size of the MPA and availability of human capital in the region. Many of these vessels are equipped with radar and visual imaging systems. Often, surveillance efforts are coordinated with the local community to help determine the area's monitoring and governance needs.[226] Although this type of surveillance is technologically simple, it is more cost-effective for small MPAs because it only requires physical labor, as opposed to expensive technology. Current surveillance practices rely on local authorities to enforce the law. Some nations have turned to agreements with developed nations and non-governmental organizations to help create navy-like forces for aid with maritime management, monitoring and enforcement. Partnerships between MPA management and outside groups are key to keeping costs low and ensuring long-term, financially sustainable monitoring.

[225] Brooke, Sandra, Lim, Tse Yang and Andron, Jeff. (2010) Surveillance and enforcement of remote maritime areas. Paper 1: surveillance technical options. Marine Conservation Biology Institute.
[226] Christie, P., White, A.T., "Best practices for improved governance of coral reef marine protected areas," *Coral Reefs*, 26 (2007): 1049.

Coastal MPA management is ineffective if it does not incorporate the interests of local stakeholders in the on-shore community.[227] Near shore MPAs need to incorporate the local, native and/or indigenous ecological understandings of the marine region into MPA protection in order to develop a sustainable management plan. There are existing social, cultural, political, and, most notably, economic structures that determine whether management of an MPA will be successful. In poor coastal communities, for example, it can be much more difficult to enforce management. If people in the area are starving, even managers are less likely to restrict fishing. In coastal areas of Tanzania and Zanzibar, persistent poverty and resource degradation often drives people to disregard the rules of MPAs.[228] In the case of the Tanzanian coast, enforcement and productivity of an MPA may need to include local measures to aid in poverty reduction, provide job alternatives, income generating projects, and financial incentives organized by local governing bodies or NGOs. It is necessary to assess the individual local coastal communities for each MPA before embarking on a plan of conservation. This requires funding to coordinate surveying, educational tools, and aid with building of local infrastructure for the community and relevant stakeholders. The success of MPA management in local coastal areas mainly requires a mutually respectful relationship. A survey is one way to determine the goals of the local communities; town meetings and coordinated consensus between scientific specialists and local stakeholders are other ways that education and financial opportunities can flow in both directions amongst all stakeholders. From surveys, or other means mentioned, the local community and MPA management can negotiate terms that will be beneficial for all parties. Negotiated terms

[227] Ferse, Sebastian C.A. et al., "Allies, not aliens: increasing the role of local communities in marine protected area implementation," *Environmental Conservation*, 37 (2010): 23.
[228] Tobey, J., and E. Torell. 2006. "Coastal poverty and MPA management in mainland Tanzania and Zanzibar". *Ocean and Coastal Management.* 49 (11): 834-854

include access rights and compensation for jobs after the MPA is created.[229] Such economic incentives are mutually beneficial for MPA administrators and the local community, but are not available for negotiation without adequate funding.

Large Scale MPAs and High Seas MPAs

Surveillance and monitoring in large and remote marine areas requires advanced technology, as coastal methods are ineffective on such a large scale. All such technologies are costly, and largely unattainable for developing nations. High seas MPA management requires extensive research on costs of employing monitoring and enforcement mechanisms, as current research shows that information available on MPA expenditures is limited.[230]

As previously discussed in the Monitoring and Surveillance Chapter, some of the recommended surveillance technologies include airborne solutions, buoys, VMS, and AIS. The costs associated with such surveillance technology heighten already existing concerns for greater MPA monitoring and enforcement funding. Once violators are identified on the high seas, enforcement actors must step in. If asset forfeiture is used as a means to protect MPAs, MPA administrators must coordinate with enforcement agencies and non-governmental organizations to educate fishermen and vessel operators on the possible consequences of violations. Educational publicity campaigns are also expensive to run in order to relay all of the MPA regulations to stakeholders. As there already exists a great funding deficit for MPA operations, surveillance technology costs remain well above what MPA administrators can afford. Although surveillance mechanisms are expensive, thorough monitoring will guarantee effective

[229] McCay, Bonnie J. and Jones, Peter J.S., "Marine Protected Areas and the Governance of Marine Ecosystems and Fisheries," *Conservation Biology*, 25 (2011): 1131-1132.
[230] Gravestock, Pippa, Roberts, Callum M., Bailey, Alison, "The income requirements of marine protected areas," *Ocean and Coastal Management*, 51 (2008): 273.

enforcement for MPAs worldwide.

Barriers to Procuring Adequate Funding

Political Will

One of the major barriers to obtaining MPA funding is lack of political will. This is a major problem for MPAs in the Caribbean.[231] MPA resources are largely undervalued by politicians and by civil society as a whole. This undervaluation means MPAs do not receive the resources and funds needed from the government in order to function effectively. Such a lack of political will is due in part to failure by scientific and conservation communities. Many groups have not been sufficiently creative in their public outreach; outreach that is necessary to influence decision makers with the power to provide the funds for MPAs. Both the economic value of protecting marine resources and the vulnerability of such resources is greatly underemphasized. Decision makers and voters are not exposed to sufficient information about the importance of protecting marine resources. MPAs in the Caribbean are critiqued for this very issue, but they are not the only areas lacking the political will to fund operating costs.

Government Funding

National governments of MPAs in the developing world have severe budgetary constraints. As previously mentioned, these nations suffer from low GDP and tax revenue, not to mention many other urgent issues that may require more immediate government response than MPA protection. Issues may range from weak infrastructure to political corruption, often leaving MPA protection low on the list of priority for policy makers of the developing world.[232] This is a

[231] Vanzella-Khouri, Allesandra. "Challenge Facing MPAs in the Carribean: Lack of Political Will." 2011. MPA News. 12(6).
[232] Thur, S.M. 2010. "User fees as sustainable financing mechanisms for marine protected areas: An application to…

disappointing reality, because many of the world's most vital marine ecosystems are located in the developing world. The WWF designates 19 sites around the globe where it focuses its operations. Sites are chosen based on the wealth and diversity of life present, the gravity of the challenges they face, and the ability of humans to positively impact them. All of the marine sites listed by the WWF's website, as of February 2012, are located in the developing world: Coastal East Africa, the Coral Triangle, the Mesoamerican Reef, the Galapagos, and the Gulf of California. Unfortunately, the world's regions with the most biodiversity are almost exclusively located in the countries that are least financially prepared to protect them.

Long-Term Sustainability

Currently, MPAs face problems with long-term sustainability due to lack of sufficient funding to operate MPAs long-term. Groups like the IUCN, UNEP, and National Marine Protected Areas Center have already begun establishing networks for MPAs, but this is only the beginning. In order to sustain MPAs over time, MPA administrators and stakeholders need to reconsider the deficit between cost of MPAs and inadequate funding resources. The following sections will explore the funding options to close this gap and secure long-term financial stability for MPAs.

Funding Options

Endowments

Endowments are the simplest way to fund MPAs over the long term.[233] One initial large deposit can be enough money for an MPA to fund its day-to-day operations through the interest

[233] Davis, John. "MPANews.org." Lecture, Task Force Class Presentation, University of Washington, Seattle, January 12, 2012.

from the endowment. Endowments can also provide financial reserves to help cover unexpected expenses, and can create a feeling of permanence that permeates throughout the entire staff, community, and donors connected to the MPA. This has proven to be beneficial to the success of the MPA. MPAs seeking donors should establish an independent, transparent organization to manage the funds. MPA managers should also create a business plan to indicate to donors that the MPA is well organized, and that funds will be spent wisely. It is important to note that money from outside donors is not necessary for the establishment of an endowment. The Endowment for Aleipata and Safata MPAs in Samoa was established with money earned by the preserve through user fees.[234] This is a feasible option for MPAs that succeed in raising funds above and beyond their operating costs through tourist revenue. Overall, endowments are an effective way to provide much of the necessary funding for MPAs.

Ecotourism: Funding Coastal MPAs through User Fees

User fees for ecotourism serve as another viable option to aid MPAs of the developing world in becoming self-financing over the long term. User fees could be implemented for activities such as scuba diving, snorkeling, recreational boating, hiking, and lodging. These fees are extremely underutilized by MPAs as there is a common misconception within the tourist industry that visitors are unwilling to pay for conservation. In 2002, only 34 of the 484 MPAs in the wider Caribbean charged any sort of user fee.[235] Opposition from the tourist industry, stemming from this misconception, then causes marine parks to lower user fees or to stop charging altogether. Contrary to this belief held by stakeholders in the tourist industry, countless studies have shown that most users of MPAs, particularly divers, are willing to pay significant

[234] "Creating Endowments for Sustainable Funding of MPAs: Practitioners Describe Opportunities and Challenges." 2008. *MPA News.* 9(10).
[235] "Tools and Strategies for Financial Sustainability: How Managers Are Building Secure Futures for Their MPAs". 2003. *MPA News.* 5(5).

fees for use of marine parks, provided they are informed that their money is going towards conservation efforts. These types of fees can be sufficient to fund surveillance and enforcement for marine parks in the developing world and can be implemented in a variety of ways. Implementation should be carefully planned to fit the specific marine park and community in question. This next section will outline a variety of user fees that have been used in marine reserves run by governments and organizations with limited funding available for surveillance and enforcement. This section will conclude with a review of which types of user fees have been most successful.

Private Collection of User Fees

One funding strategy proven to be effective is the private ownership of an MPA. The private company can charge user fees for use of the park, and then use those fees to reimburse local fishermen for ceding exclusive access rights to the company. The private company can use the user fees for other forms of monitoring and enforcement within the MPA as well. For example, a private dive tour company funds the Shark Corridor Marine Reserve in Fiji. The company has reached an agreement with three local villages, who agree not to fish inside the 40km area where the company operates. In return for these exclusive access rights the company pays the village fisherman $10 per diver per day. This partnership has proven effective as a 2004 survey of the park found 267 species present and 400 species present by 2008. Additionally, fishing yields outside of the no-take zone had increased by 2008. In addition to providing the funds to pay for access rights, the dive company has also been able to fund twelve rangers to police and enforce the fishing practices of those not party to the three village partnership. This partnership illustrates how a private company can successfully pay for access rights and additional forms of surveillance and enforcement through user fees.[236]

[236] Buckley, Ralf. 2010. *Conservation tourism*. Wallingford, Oxfordshire, UK: CAB International.

Increasing Existing User Fees

In addition to implementing user fees, parks that have existing user fees, in many cases, should increase their user fees. One study at a quality recreational site in the Bonaire National Marine Park in the Netherlands showed that divers were willing to pay much more for annual use than the current $10 fee. Answers ranged from $61 to $134 for annual use.[237] Overall, visitors displayed WTP much higher than the actual existing user fees. Although the findings of the study are location specific, in a general sense the study is widely applicable. The study illustrates that WTP is often significantly higher than existing user fees for marine parks. In many cases WTP is enough to fully fund MPA management costs. User fees are thus a viable option for marine parks in countries where governments lack the resources to support effective MPA management. The STENAPA is the NGO that manages two protected areas on the Island of St. Eustatisus in the Netherlands. User fees initially did not cover the operational costs of the parks, so the NGO did a willingness to pay survey, which found that 72 percent of 100 divers surveyed were willing to pay more than the current user fees. Further, a comparative survey of 18 different WTP studies found that there is an overwhelming willingness to pay for entry into marine parks. The survey covers MPAs in the Pacific, South East Asia, the Galapagos, the Caribbean, the Indian Ocean, and the Mediterranean.[238] Users were in favor of the introduction of new entry fees, or increases in existing entry fees. In general, users were willing to pay more if they understood that their money would go directly towards funding conservation efforts in the regions in question.

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http://public.eblib.com/EBLPublic/PublicView.do?ptiID=617541.

[237] Thur, S.M. 2010. "User fees as sustainable financing mechanisms for marine protected areas: An application to the Bonaire National Marine Park". *Marine Policy.* 34 (1): 63-69.

[238] Peters, H., and J.P. Hawkins. 2009. "Access to marine parks: A comparative study in willingness to pay". *Ocean and Coastal Management.* 52 (3-4): 219-228.

The survey includes other key findings, which could prove helpful for MPA managers when planning the fee structures for their parks. In many regions, WTP was positively correlated with income level of the respondents. Foreign visitors were sometimes willing to pay much more than local residents. This was the case in Pulau Payar, Malaysia, where foreigners were willing to pay more than twice what locals were willing to pay. In places like this, a two-tiered system in which foreigners pay higher prices than citizens can prove effective. In some places, such as certain marine parks in the Philippines, higher user fees would have the additional benefit of reducing damage to the park through reduction in the number of visitors. A final useful element of this study is that it includes information on which actors were trusted to collect fees. In some places, such as Hawaii, the government was trusted most. In others, such as the Philippines, government involvement in fee collection was highly unpopular.

Managers of MPAs should conduct WTP surveys for their parks. In this way, they can increase their prices in accordance with the value that visitors place on their experiences in the parks. They can also tailor their fee structure to the views of their visitors by using a two-tiered system for visitors and locals, if the survey findings deem it appropriate. MPA managers can also use the findings from this type of survey to ensure that the actors collecting the user fees are the ones trusted most by the public. Finally, management can assess which factors lead to increased WTP and use this information to give the public the facts that will make them more willing to pay more for their experience within the marine parks.

Using Marine Parks to Fund other Conservation Efforts Inside MPAs

The solutions explored in the previous section are feasible in areas with strong tourist industries, such as marine parks that focus on tourist activities like snorkeling and scuba diving.

These marine parks are able to generate enough revenue from user fees to completely fund purchase of access rights as well as effective monitoring and enforcement. These profitable marine parks can use their excess profit to fund other conservation efforts within the same MPA. For example, the Bonaire Marine Park generates excess revenue above its management costs, due to its location at a desirable coral reef. The Bonaire Marine Park uses its excess money to fund management costs of the terrestrial National Park that is managed by the same NGO.[239] This example illustrates how marine parks can represent the "crown jewel" in marine governance structure. Marine parks have the ability to concentrate tourists in environmentally appropriate areas, and WTP is often high enough that excess revenue can be used to fund management of areas that cannot generate sufficient revenue through user fees. These areas include no-take zones, fishery management zones, scientific reserves, and terrestrial preserves that directly affect the marine environment.

Funding Remote MPAs Through Regional MPA Networks

Some MPAs are too remote to fund their operation costs through revenue from user fees alone. A solution for funding these types of MPAs is to form MPA networks with a central fund that can use excess income from popular tourist MPAs to subsidize those MPAs that are not self-financing. MPA networks can help meet funding challenges, but they have additional benefits as well. MPA networks can serve to protect ecosystems and migratory species over broader regions than individual MPAs, and can also provide more resilience in the face of non-point source threats such as climate change.[240] Finally, MPA networks can often secure large amounts of

[239] Thur, S.M. 2010. "User fees as sustainable financing mechanisms for marine protected areas: An application to the Bonaire National Marine Park". *Marine Policy.* 34 (1): 63-69.
[240] Gleason, M., S. McCreary, M. Miller-Henson, J. Ugoretz, E. Fox, M. Merrifield, W. McClintock, P. Serpa, and K. Hoffman. 2010. "Science-based and stakeholder-driven marine protected area network planning: A successful case study from north central California". *Ocean and Coastal Management.* 53 (2): 52-68.

funding that would be unavailable to individual MPAs. Governments and foundations are often unwilling to commit capital unless they can have confidence that the MPA will be able to deliver conservation services on a meaningful scale. Individual MPAs cannot instill this confidence in potential donors, but MPA networks can. In order to tap into these funds, MPA networks should be overseen by a nonprofit with expertise, accountability, and transparency to coordinate all scales of investment.[241] Such an organization would help MPA networks access large funds from conventional sources, funds that are generally unavailable to small, independent MPAs.

It can be difficult, however, to form an MPA network. The process involves highly politicized decisions regarding the raising and allocation of funds. It also takes away much of the decision-making power and autonomy from local MPA authorities. Many of these authorities may be unwilling to cede their power to a central authority.[242] Additionally, developing countries housing MPA networks may have corrupt governments that would manage a network of MPAs less ethically than local managers.

Despite these difficulties, MPA networks should be implemented carefully, wherever possible. Regional-scale MPA network planning requires a great deal of coordination in compiling data, establishing design, involving stakeholders, and establishing a management framework.[243] Specifically, the MPA network must be established through legislation and a central management authority must be designated to oversee the network. Finally, there must be substantial political will at a high level of government. An MPA network was successfully

[241] "Tools and Strategies for Financial Sustainability: How Managers Are Building Secure Futures for Their MPAs". 2003. *MPA News.* 5(5). (3 above)
[242] "Science, funding and participation: key issues for marine protected area networks and the Coral Triangle Initiative". 2009. *Environmental Conservation.* 36 (2): 91-96.
[243] Gleason, M., S. McCreary, M. Miller-Henson, J. Ugoretz, E. Fox, M. Merrifield, W. McClintock, P. Serpa, and K. Hoffman. 2010. "Science-based and stakeholder-driven marine protected area network planning: A successful case study from north central California". *Ocean and Coastal Management.* 53 (2): 52-68. (already referenced)

established in California using all of the aforementioned guidelines. The MLPA of 1999 provided the legal mandate for the state to improve protection of its coastal waters through an MPA network. The MLPA requires use of current scientific data as well as participation of experts, stakeholders, and the public in the planning process. The goals of the act are to protect ecosystems and species in California's waters in a more cohesive, sustainable manner, and to improve recreational, educational, and study opportunities with minimal damage to marine ecosystems. The law also clearly states that the network should function with sufficient monitoring and enforcement. With a legal mandate, political will, adequate funding, stakeholder participation, scientific backing, and clear guidelines for management and enforcement, the MLPA established a successful, functioning network of MPAs. These guidelines can be used elsewhere to establish functioning MPA networks.[244]

MPA networks can be established in developing nations as well, as illustrated by an MPA network recently established in Kenya. The Malindi and Watamu Marine Reserves and Parks are financially self-sustaining, but the Kiunga National Marine Reserve is located in an area too remote to attract the volume of tourists necessary to fund daily operations costs. Within the Kenyan MPA network, income generating parks remit their excess income to a central fund which then allocates the excess to help cover the operational costs of more remote MPAs.[245]

Both the Kenya and California examples indicate that MPA network development is possible at the national and regional level, as well as in the developed and developing world alike. Where the legal framework, availability of scientific data, and political will allow for it,

[244] Gleason, M., S. McCreary, M. Miller-Henson, J. Ugoretz, E. Fox, M. Merrifield, W. McClintock, P. Serpa, and K. Hoffman. 2010. "Science-based and stakeholder-driven marine protected area network planning: A successful case study from north central California". *Ocean and Coastal Management.* 53 (2): 52-68. (already referenced)
[245] Francis, Julius, Agneta Nilsson, and Dixon Waruinge. 2002. "Marine Protected Areas in the Eastern African Region: How Successful Are They". *AMBIO: A Journal of the Human Environment.* 31 (7): 503-511

MPA networks should be implemented to better protect marine ecosystems over broader areas and over the long term.

Cutting Costs

In addition to obtaining increased revenue to fund monitoring and enforcement, MPAs can also reduce funding needs by cutting costs. Low cost monitoring and enforcement technologies have been explored in previous sections. MPAs costs can also be cut with the help of volunteers and private partnerships.

Volunteers

To cut costs, MPAs can use volunteers for general maintenance help. This strategy has been employed successfully by the Bunaken National Park in Indonesia, which uses volunteers from formal service organizations like the Volunteer Service Abroad. These volunteers receive extensive Indonesian language training, making them great assets to park management, as they can interact with visitors and minimize the number of paid employees. Volunteers can help perform entrance fee checks and make educational presentations to visitors, and are also valuable for communicating with visitors from their home countries. The Chumbe Island MPA has used the internet to recruit volunteers to help keep management costs at a minimum.[246] Volunteers conduct baseline surveys, do trail maintenance, dispense educational materials, and help with other management activities. The 65,000 square kilometer Seaflower MPA in Colombia is overseen by the governmental organization CORALINA. CORALINA organizes a variety of effective volunteer programs that involve local stakeholders. The SAC for example is comprised of a variety of invited volunteers such as tourist operators, artisinal fishers, professional divers, and indigenous users. The SAC is consulted on all MPA decisions. Volunteers also site,

[246] Francis, Julius, Agneta Nilsson, and Dixon Waruinge. 2002. "Marine Protected Areas in the Eastern African Region: How Successful Are They". *AMBIO: A Journal of the Human Environment.* 31 (7): 503-511.

maintain, and inspect buoys for the MPA's buoy monitoring system. Volunteers help with less formal monitoring by conducting household surveys, baseline surveys of the marine environment, and other research endeavors.[247] In addition to the benefit of cutting costs, volunteers at the Seaflower MPA have also improved local support for the MPA, as the volunteers become informal educators within their communities. Volunteers have proven themselves a valuable tool.

Partnerships to Cut Costs

In order to minimize use of MPA resources, MPAs can seek to partner with various governmental and non-governmental organizations. These organizations can perform some management tasks for the MPA. In the past, managers of MPAs have partnered with state level agencies such as the US Department of Defense, the Coast Guard, NOAA, and NASA for assistance in monitoring and enforcement.[248] Partner organizations can shoulder some of the cost burden of monitoring and enforcement.

Donor Organizations

MPAs can seek funding through international aid organizations as well as NGOs. One source of funding is multilateral banks. These institutions include the World Bank, Asian Development Bank, Africa Development Bank, and Inter-American Development Bank. These banks generally only sponsor government run or government approved projects. In order to access funds from these institutions, MPAs should contact their government's liason to the bank. Another funding option is bilateral donor organizations such as USAID in the United States and similar institutions in other developed nations. These institutions generally focus on poverty alleviation programs with biodiversity components. MPAs should first research to discover the

[247] "Use of Volunteers in MPA Management: Opportunities, Challenges, and Advice". 2006. *MPA News*. 7(8).
[248] "Stretching Your MPA Budget: How to Do More With Less Funding". 2002. *MPA News*. 3(9).

donor organization's vision for the MPA's home nation, then the MPA should network with the appropriate national embassy and with the MPA's own government to establish how the area's initiative can fit with the donor organization's mission. A final funding option is International NGOs such as the World Wildlife Fund and the Nature Conservancy. MPAs should first learn about the NGO's priorities and goals, and then contact their local, regional, or national office to propose how the MPA's goals can fit in with the NGO's mission.[249] Securing donations from these organizations can be difficult, because these groups are sometimes reluctant to fund conservation on a small scale[250]. However, funding from these groups is still a viable option that managers should pursue.

Crowd Source Funding

Crowd source funding can be used to help with the start-up costs of MPAs, particularly the cost of foregoing profits initially when designating no-take zones. Crowd source funding is also useful for sustaining funding, especially through the "Kickstart MPA" model. The following sections will explore two types of crowd source funding—microfinance and crowdfunding—and explain how these types of funding models can potentially be used to fund MPAs.

Microfinance

Background

Access to traditional credit institutions, such as banks and credit unions, is not an option for most of the world.[251] Greater access to credit expands the potential productivity of individuals, so the portion of the world's citizens without access to credit is at a major

[249] "Finding International Funding for MPAs: Places to Search." 2002. MPA News. 3(10).
[250] "Stretching Your MPA Budget: How to Do More With Less Funding". 2002. *MPA News.* 3(9).
[251] "Kiva." Kiva. Accessed January 15, 2012. http://www.kiva.org.

disadvantage when seeking to grow their profits, even to the point of sustenance. Alternative financial institutions are necessary for such growth to occur, and microfinance is such an option.

Modern microfinance, a method of lending that does not discriminate against those without collateral in low-income brackets, provides access to credit institutions for the world's poor.[252] Typically, microfinance involves small loans not funded by large commercial banks. As the amount borrowed is small, the interest rates are proportionally higher than with larger loans, but still nominally small. Despite traditional economic warnings against such lending practices,[253] microfinance has proven itself to be a very successful lending method.

Model Microfinance Institution

Based on the recommendation from renowned marine ecologist and explorer Enric Sala,[254] Kiva was selected as a model microfinance institution. Kiva partners with microfinance institutions around the world to connect individual lenders with other institutions and people that they otherwise would not be able to lend to or borrow from. Kiva's partner institutions are called "Field Partners." Loans are requested through these Field Partners, and requests are then sent to Kiva for review, editing, translation, and finally publication on the Kiva website. Potential lenders are then able to browse through these loan profiles and select to whom they would like to loan. The lender sends the money to Kiva who then disperses it to the Field Partner to give to the borrower. As the money is repaid to the Field Partner, the Field Partner sends it back to Kiva, who then deposits it back into the lender's account. As the loan is being repaid, lenders are sent progress updates on their associated borrower. Lenders can then choose to re-loan that money

[252] "What Is Microfinance?" CGAP. Accessed January 15, 2012. http://cgap.org/p/site/c/template.rc/1.26.1302/. "CGAP is an independent policy and research center dedicated to advancing financial access for the world's poor."
[253] Armendariz, Beatriz, and Jonathan Morduch. *The Economics of Microfinance*. Cambridge, MA: MIT Press, 2005.
[254] Sala, Enric. Interview by Task Force. Videoconference. Seattle, WA. January 10, 2012.

elsewhere, donate to Kiva, or withdraw their money.[255]

Kiva for MPAs

Financially speaking, investing in an MPA is in the interests of the fisherman. After five years of limited to no fishing, spillover from fish population within the MPA into non-MPA waters results in profits that exceed the amount lost during those five years.[256] Despite the future long-term gains of spillover fish, for those who are uninterested or unwilling to lose profits in the short-term for the first five years, fisherman can be financially compensated in a variety of ways. One such way is through microfinance. Interested parties can, with the assistance of local financial experts, draft a loan based on the projected earnings from territory sectioned off for an MPA.

Two notable differences between typical microfinance loans and these loans are the amount being borrowed, and the length of time before the loan is repaid. Generally, microfinance lending involves small loans for short periods of time. To offset the temporary loss of profits to create a MPA, these loans would need to be for greater amounts of money and longer lengths of time. These differences will need to be taken into account when determining the appropriate interest rate and loan disbursement methods. Interest rates may need to be lower than those for typical micro-loans and disbursement may be best if it occurs incrementally instead of all at once. This alternative disbursement method may also offset interest rates, allowing less time for interest to accrue.

Like the Kiva model, local microfinance institutions would partner with a larger group (a "Kiva" for MPAs, hereafter referred to as "Kiva MPA"). Fishermen would then work with their

[255] "Kiva." Kiva. Accessed January 15, 2012. http://www.kiva.org.
[256] Sala, Enric. Interview by Task Force. Videoconference. Seattle, WA. January 10,

peers in the borrowing process but would not be restricted to funds coming solely from their local community. Such a partnership provides them access to more credit. If no local microfinance institutions exist in an area where there are fishermen interested in helping to create an MPA, they can petition the "Kiva MPA" group to help them establish one. "Kiva MPA" would then send a representative to work with the local business and governance structure to design a microfinance institution that is sustainable within that specific community. The "Kiva MPA" would serve as an international NGO, drawing on the expertise of people from around the world.

Crowdfunding

Background

Crowdfunding differs from microfinance in that the money collected via crowdfunding is not repaid; the money is essentially "gifted" or donated. Crowdfunding is a cooperative venture to fund the efforts of others. Typically, funding is directed through the Internet.[257] Historically, crowdfunding has been used to finance efforts such as creative projects, start-up businesses, and social projects.[258]

Model Crowdfunding Institution

Kickstarter is an extremely successful crowdfunding platform.[259] As such, Kickstarter has been selected as a crowdfunding model on which to base such an organization dedicated to collecting funds for MPAs.

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[257] Andrea Ordanini, Lucia Miceli, Marta Pizzetti, A. Parasuraman, (2011) "Crowd-funding: transforming customers into investors through innovative service platforms", Journal of Service Management, Vol. 22 Iss: 4, pp.443 – 470.
[258] Hemer, Joachim, (2011), A snapshot on crowdfunding, No R2/2011, Working Papers "Firms and Region", Fraunhofer Institute for Systems and Innovation Research (ISI)…
[259] F, G. "Micropatronage Sweet Spot: The Micro-price of Micropatronage | The Economist." The Economist. September 27, 2012. Accessed January 15, 2012…

Kickstarter is an organizational structure that connects "Project Creators" – people who are asking for funds to finance their creative venture – with "Backers" – people who are donating funds to projects listed on the Kickstarter website. Anyone, in accordance to the terms and conditions of Kickstarter, can submit a project. In a project profile, creators include a description of their proposed project, the amount of money they are requesting, and a deadline for fundraising. Once the projects are published on Kickstarter, these profiles are visible by category and they have a count-down to indicate how much of the project has been funded and how much time the project has left to reach its fundraising goal. Only if *all* the funds are collected do the Project Creators receive the money. The funds are collected via Amazon Payments, a third party.[260]

Kickstarter for MPAs

Kickstarter focuses on creative projects. By using the same methods of collecting funds, displaying "profiles" and managing finances, an organization that sponsors MPAs instead of creative projects can be created and incorporated. The "profiles" submitted would include information on potential MPAs, or MPA sub-projects, and "Sponsors". The information on MPAs would include items such as its purpose, size, regulations, enforcement, and all associated costs. MPA sub-projects could include conducting research to determine baseline data for ecological and socioeconomic management of a potential MPA site. As long as the sub-project is in the service of creating or fixing an MPA, it can qualify as an MPA sub-project and thus be eligible for a profile on the site. The information on the "Sponsor" (the equivalent of the Project Creator) would include items such as who they are and why they want to create the MPA they have outlined. Sponsors can be individuals, organizations, and governments. The third party

[260] Kickstarter. Accessed January 16, 2012. http://www.kickstarter.com/.

funds carrier (Amazon Payments for Kickstarter) needs to be an organization or company that has international applicability in terms of legal structure so that potential MPAs can be funded all around the world.

The "Kickstarter" for MPAs (hereafter called "Kickstarter MPA") would also seek ways to increase fundraising by increasing awareness of their existence. In particular "Kickstarter MPA" would target companies with donation matching programs, and especially companies that have a clear stake in MPA development. Examples of such companies include Microsoft and Boeing. To make MPAs more efficient, their monitoring and enforcement costs need to go down. Companies such as Microsoft and Boeing are in a position to conduct the necessary R&D and production of such technology and infrastructure.[261]

As the numbers of MPAs grow, so does the spillover. With more fish available on the market, prices will go down. So consumers of fish, both businesses and individuals, also have a direct stake in the creation of MPAs. These companies and people will also be targeted by "Kickstarter MPA" for not only donation matching, but also as potential Backers.

Concluding Funding Recommendations

Coastal MPAs

Coastal MPAs can set up endowments to fund their MPAs over the long term. This will give the MPA a powerful sense of permanence that will improve its effectiveness and the quality of the staff it attracts. User fees are also effective in areas that can attract significant numbers of tourists, and these user fees should be chosen based on WTP surveys conducted on visitors to the

[261] Davis, John. "MPANews.org." Lecture, Task Force Class Presentation, University of Washington, Seattle, January 12, 2012.

marine parks. Even parks with existing fees should conduct WTP studies, as user fees can often be substantially increased with little or no effect on park visitation rates. MPA managers should use WTP studies to determine whether to employ a two-tiered system for locals and visitors, as well as which actors would be most trustworthy to collect fees. MPAs can also cut costs in the short term by using volunteers and partner organizations to shoulder some of the monitoring and enforcement responsibility. Additionally, crowd source funding methods should be explored when looking to offset start-up costs. Microfinance and crowdfunding are excellent resources for clearly delineated efforts that go towards establishing and fixing MPAs.

High Seas MPAs

High Seas MPAs can also use endowments for long-term funding. Additionally, regional and national MPA networks should be established, so that self-financing MPAs can remit profits to help fund remote high seas MPAs. These large MPA networks provide conservation on a large scale, making them more attractive to large international donor agencies. MPA networks should seek funding from these conventional organizations to supplement other funding strategies.

Recommendations for Community-Based MPAs

Legal Frameworks	Monitoring, Surveillance, and Enforcement	Funding and Maintenance Costs
Solidify property rights and conservation legislation.	Within stakeholder committee meetings, create education, media, and public campaigns to adequately inform stakeholders of the threats to MPAs and the serious legal consequences for violations of MPA law. Follow the model of "interpretive enforcement."	Conduct WTP studies to determine highest willingness to pay and implement maximum user fees in areas that attract significant numbers of tourists. Consider employing a two-tiered fee system for locals vs. visitors and decide which actors will be responsible for collecting these fees.
Encourage CBRMs to define their own clear community goals and rules; create advisory groups and conduct surveys to draft sustainable enforcement and monitoring plans. Include all local stakeholders in the policy-making process. Continue to coordinate within the group to give feedback on progress and facilitate positive change.	Focus on improving manned patrol fleets. If communities cannot effectively monitor with their current resources, explore multilateral partnerships with developed nations.	Seek long-term endowments to cover management and operation costs. Use volunteers and partner organizations to lower administration, monitoring, and enforcement costs.
With the help of large national or international policing and enforcing organizations, use asset forfeiture to receive proportional gains from confiscated property. Put all proceeds towards improving man-power and enforcement mechanisms.	Increase number of mooring buoys to mark off MPA boundaries.	Create crowd-source funding websites under the Kickstart model to generate Internet funding and off-set start-up costs.
Create a *de facto* international standard that will facilitate the legitimacy of certification and eco-labeling (participation at all 3 MPA levels is essential to establishing this standardizing body).	Increase funds for vessel patrolmen. Hire members of the local community to monitor in the patrol vessels; utilize volunteers across the board to help reduce labor costs.	Create local MPA networks to share funding revenues.

Recommendations for Cross-Regional MPAs

Legal Frameworks	Monitoring, Surveillance, and Enforcement	Funding and Maintenance Costs
Include text on asset forfeiture in the UNCLOS (including requirements regarding international coordination and funding delegation) and implement asset forfeiture penalties in cross-regional MPAs.	Take advantage of agencies and NGOs offering free or low cost equipment for VMS and AIS systems. Work with local communities and funding sources to establish terrestrial AIS stations to implement full coverage of EEZs.	Conduct WTP studies to determine highest willingness to pay and implement maximum user fees in areas that attract significant numbers of tourists.
Individual State Parties should sign onto the UNCLOS and find the arrangement that works best within their legal/political structure. Guidelines that should follow are listed in the Legal Chapter under "Asset Forfeiture Policy Recommendations," in "(Cross-Regional) National, EEZ MPAs."	Establish relations with developed nations to take advantage of satellite-based AIS systems; most specifically nations that have contracts with ORBCOMM. Develop a monitoring relationship and alert system through this satellite access.	Establish regional and national MPA networks to share funding revenues.
Modify CITES Appendix 2 to regulate import control in addition to export control, add depleted commercial fish species to Appendix 2 of CITES treaty. All fishery products should have compulsory labeling and certifications at point of sale. (In cases where fisheries management has failed and fish are at risk of endangerment or extinction, the CITES agreement should act as a complementary conservation tool to the RFMO. CITES should step in to ban the trade of that fish stock.)	Establish data sharing relations among developed and developing nations to aid with high-tech equipment and training (acoustic monitoring systems, VMS, AIS, etc.). Collaborate with countries considering/implementing UA surveillance and create a strategy for future use.	Use microfinancing for short-term financial gains and crowd source funding for the long-term.
Create a *de facto* international standard that will facilitate the legitimacy of certification and eco-labeling.	Create education, media, and publicity campaigns targeted to appropriate stakeholders. Campaigns must be adjusted to address a larger scale region.	Seek foreign aid from multilateral banks, bilateral organizations, and international NGOs.

Recommendations for International High Seas MPAs

Legal Frameworks	Monitoring, Surveillance, and Enforcement	Funding and Maintenance Costs
Include text in the UNCLOS authorizing international cooperation in the monitoring and enforcement of international MPAs.	Emphasize roving options for launching UA surveillance technology.	Create long-term endowments to cover management and operations costs.
Encourage US government to sign onto the UNCLOS treaty. After signing, US government needs to make a formal request at the annual UNCLOS conference of the parties to include the fish stocks 'surrogate enforcement' clause.	Implement same monitoring and enforcement policies as within cross-regional MPAs. Work with developed nations when satellite imagery, aerial surveillance, etc. is required by criminal investigations.	Establish regional and national MPA networks allowing self-financing MPAs to remit profits toward high seas MPA funding and attract foreign aid.
Asset forfeiture exists within the port-state's jurisdiction, but proceeds can be split between assisting parties. Enforcement officers should be given jurisdiction to confiscate, even if violators fly the flag of another State Party. Upon confiscation, the two aggrieved States decide which legal structure to operate under, but have agreed through the treaty that prosecution can take place under either nation's legal system.	Create education, media, and publicity campaigns targeted to appropriate stakeholders. Campaigns must be adjusted to address a global scale audience.	Use crowd-source funding websites like Kickstart to generate additional funds.
By signing the UNCLOS, State Parties agree to increase funding for high seas monitoring technology. This information should be made available to all signing Parties.		
Put Article 21 (a) of the UN Fish Stocks Agreement into the section on High Seas in the UNCLOS, so that fishing vessels breaking RFMO conservation measures on the high seas can be addressed by any nation that is party to the treaty.		
Create a *de facto* international standard that will facilitate the legitimacy of certification and eco-labeling.		

Concluding Remarks

Elizabeth Cook

This Task Force sought to address some of the pressing concerns of established MPAs, concerns that exist alongside a number of other threats to our world's vast marine ecosystems. With a focus on IUU overfishing, this document attempts to create real change by addressing a single, more manageable issue. Our work specifically addresses those fishing challenges faced by developing nations, as MPAs of developing nations typically lack sufficient protection resources. A major goal of this Task Force was therefore to overcome "paper parks," those MPAs that exist on paper but not in practice, due to lack of effective rule enforcement. While we believe our list of recommendations has the potential to aid in ongoing international negotiations surrounding marine protected environments, we also acknowledge that our work has limitations. Implementation can be the hardest part, and many of our recommendations are dependent on the cooperation of the global community as a whole. Weak MPAs have many difficult and necessary tasks to accomplish before they can expect to see any significant changes. But this Team believes the long-term benefits are well worth the effort and wait. We hope that this document will be considered in further research and that its presentation will impact future solutions to marine protection challenges.

Bibliography

"About." United Nations Environment Programme: Environment for Development. Regional Seas. <http://www.unep.org.offcampus.lib.washington.edu/regionalseas/about/default.asp>.

"A Constitution for the Oceans" Remarks by Tommy T.B. Koh, of Singapore. President of the Third United Nations Conference on the Law of the Sea. <http://www.un.org/depts/los/convention_agreements/texts/koh_english.pdf>.

"Advocacy," Association for Unmanned Vehicle Systems International. <http://www.auvsi.org/AUVSI/Advocacy/.> (Accessed February 26, 2012).

"Aerovironment Dragon Eye Unmanned Aircraft," Barnard Microsystems Limited. <http://www.barnardmicrosystems.com/L4E_dragon_eye.Htm.> (Accessed February 26, 2012).

Agardy, T., P. Bridgewater, M. P. Crosby, J. Day, P. K. Dayton, R. Kenchingron, D. Laffoley, P. McConney, P.A. Murray, J. E. Parks and L. Peau (2003) 'Dangerous targets: Differing perspectives, unresolved issues, and ideological clashes regarding marine protected areas', Aquatic Conservation: Marine and Freshwater ecosystems, vol 13, pp1-15.

"Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas." <www.fao.org/legal/treaties/012s-e.htm>.

"A history of the Patagonian Toothfish Fishery." Australian Government, Dept of Sustainability, Environment, Water, Population, and Communities. <http://www.antarctica.gov.au/about-us/publications/australian-antarctic-magazine/2001-2005/issue-2-spring-2001/international/a-history-of-the-patagonian-toothfish-fishery.>

Air Combat Command, Langley AFB, and VA. "*RQ-4 Global Hawk*." U.S. Air Force. 27 Jan 2012. <http://www.af.mil/information/factsheets/factsheet.asp?id=13225> (Accessed Feb 27, 2012).

"AIS ." *ORBCOMM Services*. N.p., n.d. Web. 17 Jan. 2012. <http://www.orbcomm.com/services-ais.htm>.

American Institute for Aeronautics and Astronautics. 2007. *Critical Need for Investment in Unmanned Aircraft Systems (UAS) Within the National Oceanic and Atmospheric Administration (NOAA).*

Andrea Ordanini, Lucia Miceli, Marta Pizzetti, A. Parasuraman, (2011) "Crowd-funding: transforming customers into investors through innovative service platforms", Journal of Service Management, Vol. 22 Iss: 4, pp.443 – 470.

Anna Willock. 'Uncharted Waters: Implementation Issues and Potential Benefits of Listing Toothfish in Appendix II of Cites.' Traffic International 2002.

Armendariz, Beatriz, and Jonathan Morduch. *The Economics of Microfinance*. Cambridge, MA: MIT Press, 2005.

"Australian Government Releases Proposal for Large Coral Sea MPA; Stakeholders Respond." MPANews. Vol. 13, No. 4: January-February 2012.

Badalementi, F., A.A. Ramos, E. Voultsiadou, J.L. Sanchez Lizaso, G. D'Anna, C. Pipitone, J. Mas, J.A. Ruiz Fernandez, D. Whitmarsh, and S. Rigio. 2000. "Cultural and socio-economic impacts of Mediterranean marine protected areas". *Environmental Conservation.* 27 (2): 110-125.

Baker, Maria C., and A. Charlotte De Fontaubert. 2001. *The status of natural resources on the high-seas: an independent study conducted by the Southampton Oceanography Centre & Charlotte de Fontaubert*. Gland, Switzerland: WWF--World Wide Fund for Nature.

Ballet, J., P. Lopez, and N. Rahaga. "The Illegal Export of Precious Wood (Dalbergia and Diospyros) in Madagascar: 2009 and After." Madagascar Conservation and Development 5, no. 2 (2010): 110-116.

Balmford, Andrew, "The worldwide cost of marine protected areas," *Proceedings of the National Academy of Sciences,* 101 (2004): 9694.

Barrett, M. A., J. L. Brown, M. K. Morikawa, J. N. Labat, and A. D. Yoder. "CITES Designation for Endangered Rosewood in Madagascar." Science (Washington) 328, no. 5982 (2010): 1109-1110.

Barry Bearak, "Mayor Declares a Coup in Madagascar," New York Times, January 31, 2009.

Bavinick, J., Pierre Failler, and Andy Thorpe. "Marine Protected Areas (MPAs) Special Feature: Editorial." Environmental Management: Vol. 47, Issue 4. Springer New York: April 1, 2011. 519-524. < http://www.springerlink.com.offcampus.lib.washington.edu/content/nt17178440735137/ fulltext.pdf>.

"Big Threats: The Main Factors Destroying Ocean Health." State of the Ocean.org. Web. 31 Jan. 2012. <http://www.stateoftheocean.org/threats.cfm>.

BoatTest.com. "U.S.C.G. Defender Class." <http://www.boattest.com/resources/view_news.aspx?NewsID=853.> (Accessed March 2, 2012.)

Brooke, Sandra, Lim, Tse Yang and Andron, Jeff. (2010) Surveillance and enforcement of remote maritime areas. Paper 1: surveillance technical options. Marine Conservation Biology Institute.

Brooke SD, Lim TY, and Ardron JA. (2010) Surveillance and enforcement of remote maritime areas. Paper 15: surveillance technical options. Marine Conservation Biology Institute, USA. Version 1.2; 39 Pages.

Bruner, Aaron G., Gullison, Raymond E., and Balmer, Andrew, "Financial Costs and Shortfalls of Managing and Expanding Protected-Area Systems in Developing Countries," *BioScience*, 54 (2004): 1119.

Bruné, Richard E. (R. E.). . CITES Regulation of Brazilian Rosewood. Vol. 11, 1992, <http://search.ebscohost.com/login.aspx?direct=true&db=mah&AN=MAH0000358376&site=ehost-live>.

Buckley, Ralf. 2010. *Conservation tourism*. Wallingford, Oxfordshire, UK: CAB International. <http://public.eblib.com/EBLPublic/PublicView.do?ptiID=617541.>

Caldeira K, and ME Wickett. 2003. "Oceanography: anthropogenic carbon and ocean pH.". *Nature.* 425 (6956).

Caldwell, Roy; Fox, Helene. 2006. "Recovery from Blast Fishing on Coral Reefs: A Tale of Two Scales. *Ecological Applications:* Vol. 16, No. 5, pp. 1631–1635.

Campbell, Martin et. al. "MPA Enforcement: How Practitioners are Developing New Tools, Strategies, and Partnerships." *MPA News*, 11 (2010).

Carpenter K.E., Livingstone S.R., Polidoro B.A., Sanciangco J., Smith J., et al. 2008. "One-third of reef-building corals face elevated extinction risk from climate change and local impacts". *Science.* 321 (5888): 560-563.

Casella, Stefan D. "The Development of Asset Forfeiture Law in the United States." 2003 Acta Juridica 314 (2003).

CCLMAR <http://www.ccamlr.org/pu/e/sc/fish-monit/IUU-Vessel-List-Dec-2011.pdf>, NEAFC <http://www.neafc.org/illegalfishing>, NAFO <http://www.nafo.int/fisheries/frames/fishery.html>.

Cheung, William W. L. 2005. *Patterns of species richness in the high seas*. Montreal, Quebec, Canada: Secretariat of the Convention on Biological Diversity.

Christie, P., White, A.T., "Best practices for improved governance of coral reef marine protected areas," *Coral Reefs*, 26 (2007): 1049.

Chumbe Island Coral Park, "Ranger Reports," CHICOP, <http://www.chumbeisland.com/fileadmin/downloads/pdf/Conservation_Report_Mikala Peters_Nov06-1.pdf>.

Chumbe Island Coral Park, "Research Survey and Monitoring," CHICOP, http://www.chumbeisland.com/reef-sanctuary/research-surveys-and-monitoring/ (accessed February 2, 2012).

Claudet, Joachim. 2011. *Marine protected areas: a multidisciplinary approach*. Cambridge" Cambridge University.

"Clarifying Misconceptions about Marine Protected Areas," and various other articles. National Marine Protected Areas Center: U.S. Department of Commerce. National Oceanic and Atmospheric Administration. Silver Spring, MD 20910, U.S.A. <http://www.mpa.gov/pdf/helpful-resources/factsheets/mpamisconceptions2.pdf>.

Clinton, Bill. *Executive Order 13158*. Washington D.C, D.C: The White House, 2000. http://ceq.hss.doe.gov/nepa/regs/eos/eo13158.html (accessed February 28, 2012).

Closing the Net: Stopping Illegal Fishing on the High Seas (High Seas Task Force 2006). Rep. Bellegarde: Sadag, 2006. Print.

Conroy, Michael E., Branded!: How the 'Certification Revolution' is Transforming Global Corporations. Canada: New Society Publishers, 2007.

"Continuing CCAMLR's Fight Against IUU Fishing for Toothfish" in Traffic Bulletin: 2008, pp. 7. <www.worldwildlife.org>/ <www.traffic.org/species-reports/traffic_species_fish31.pdf>.

Cook, P.J. (1996). *Social trends and their impacts on the coastal zone and adjacent seas*. Rep 3, British Geological Survey.

"Creating Endowments for Sustainable Funding of MPAs: Practitioners Describe Opportunities and Challenges." 2008. *MPA News*. 9(10).

Davis, Braxton. Proceedings of the 14 th Biennial Coastal Zone Conference, " ENFORCING U.S. MARINE PROTECTED AREAS: SYNTHESIS REPORT." Last modified July 25, 2005. Accessed January 31, 2012. http://www.csc.noaa.gov/cz/CZ05_Proceedings/pdf files/Davis.pdf.

Davis, John. "MPANews.org." Lecture, Task Force Class Presentation, University of Washington, Seattle, January 12, 2012.

Dean Bialek. 'Sink or Swim: Measures Under International Law for the Conservation of Patagonian Toothfish in the Southern Ocean.' *Ocean Development and International Law* 34:2 105-137.

Department of Sustainability, environment, Water, Population and Communities, "CCAMLR Continues Effort to Protect Toothfish," Australian Antarctic Division, http://www.antarctica.gov.au/about-us/publications/australian-antarctic-magazine/2001-2005/issue-1-autumn-2001/international/ccamlr-continues-efforts-to-protect-toothfish (accessed February 15, 2012).

Development and Human Rights Section Department of Public Information. "The Agreement on High Seas Fishing." United Nations: It's Your World. N.p., n.d. Web. 27 Jan. 2012. <http://www.un.org/ecosocdev/geninfo/s>.

Druel, E., Billé, R., Treyer, S. *A legal scenario analysis for marine protected areas in areas beyond national jurisdiction.* Boulogne-sur-Mer seminar, 19-21 September 2011, Studies N°06/11, IDDRI – IUCN – Agence des aires marines protégées, Paris, France.

Elinor Ostrom, *Governing the Commons* (Cambridge: University of Cambridge Press, 1990), 88-100.

Ellen, R. F., Peter Parkes, and Alan Bicker. 2000.*Indigenous environmental knowledge and its transformations: critical anthropological perspectives*. Amsterdam: Harwood Academic.

Erik Stokstad. 'Trade Trumps Science for Marine Species at International Meeting' *Science* Apr 2010 vol 328.

Fabinyi, Michael, "Dive tourism, fishing and marine protected areas in the Calamianes Islands, Philippines," *Marine Policy*, 32 (2008), 899.

FAO Code of Conduct for Responsible Fisheries. Introduction.

'FAO Compliance Agreement' <http://www.fao.org/fishery/topic/14766/en>.

FAO Corporate Document Repository, "International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing," Fisheries and Aquaculture Department, <http://www.fao.org/docrep/003/y1224e/y1224e00.HTM> (accessed February 4, 2012).

FAO Corporate Document Repository, "Product Certification," Fisheries and Aquaculture Department, http://www.fao.org/docrep/005/y2789e/y2789e07.htm#bm07.1 (accessed January 22, 2012).

"FAO Fisheries & Aquaculture - Impacts of Fishery Activities." FAO: FAO Home. Web. 31 Jan. 2012. <http://www.fao.org/fishery/topic/12273/en>.

FAO fisheries Department, "Product Certification and Ecolabeling for Fisheries Sustainability," Food and Agriculture Organization of the United Nations, ftp://ftp.fao.org/docrep/fao/005/y2789e/y2789e00.pdf (accessed February 4, 2012).

Ferse, Sebastian C.A. et al., "Allies, not aliens: increasing the role of local communities in marine protected area implementation," *Environmental Conservation*, 37 (2010): 24.

F, G. "Micropatronage Sweet Spot: The Micro-price of Micropatronage | The Economist." The Economist. September 27, 2012. Accessed January 15, 2012. <http://www.economist.com/blogs/babbage/2010/09/micropatronage_sweet_spot.>

"Final Rule: International Fisheries; Western and Central Pacific Fisheries for Highly Migratory Species; Initial Implementation of the Western and Central Pacific Fisheries Convention." *Federal Register* , January 21, 2010. <http://www.nmfs.noaa.gov/msa2007/docs/final_rule.pdf> (accessed March 2, 2012).

"Finding International Funding for MPAs: Places to Search." 2002. MPA News. 3(10).

Fisheries and Aquaculture Department, "Labeling and Certification," Food and Agriculture Organization of the United Nations, http://www.fao.org/fishery/topic/13293/en (accessed February 5, 2012).

Flora Akwilap, *A Comparative Study on Marine Protected Areas between Australia and Tanzania*. United Nations – The Nippon Foundation Fellow January 200. <http://www.un.org/depts/los/nippon/unnffprogrammehome/fellowspages/fellowspapers/akwilapo0607tanzania.pdf>.

Fonriest Environmental. "Water Monitoring Buoy Systems." Fondriest Environmental. 11 Aug 2010. <http://www.fondriest.com/news/watermonitoringbuoy.htm> (accessed Jan 28, 2012).

Francis, Julius, Agneta Nilsson, and Dixon Waruinge. 2002. "Marine Protected Areas in the Eastern African Region: How Successful Are They". *AMBIO: A Journal of the Human Environment.*

Freeman, Scott. 2010. *Biological Science: Fourth Edition*. University of Washington.

Gelb, Alan., Sundberg, Mark. "Making Aid Work," Finance and Development: A Quarterly Magazine of the IMA, no. 4 (December 2006), <http://www.imf.org/external/pubs/ft/fandd/2006/12/sundberg.htm.>

GeoEye Inc.. "GeoEye-1." About GeoEye-1. <http://launch.geoeye.com/LaunchSite/about/>. (accessed February 29, 2012). http://www.satimagingcorp.com/svc/imaging.html

Gleason, M., S. McCreary, M. Miller-Henson, J. Ugoretz, E. Fox, M. Merrifield, W. McClintock, P. Serpa, and K. Hoffman. 2010. "Science-based and stakeholder-driven marine protected area network planning: A successful case study from north central California". *Ocean and Coastal Management.*

Graham, J., B. Amos, and T. Plumptre. 2003. Governance Principles for Protected Areas in the 21st Century. Discussion Paper. Ottawa, Ontario, Canada Institute on Governance in collaboration with Parks Canada and the Canadian International Development Agency.

Gravestock, Pippa, Roberts, Callum M., Bailey, Alison, "The income requirements of marine protected areas," *Ocean and Coastal Management*, 51 (2008): 273.

Hall, Martin A., Dayton L. Alverson, and Kaija I. Metuzals. 2000. "By-Catch: Problems and Solutions". *Marine Pollution Bulletin.* 41 (1-6): 204-219.

H.E. Fox, P.J. Mous, J.S. Pet, A.H. Muljadi, R.L. Caldwell. 2005. Experimental assessment of coral reef rehabilitation following blast fishing. CONSERVATION BIOLOGY Vol. 19, No. 1, pp. 98-107.

Hemer, Joachim, (2011), A snapshot on crowdfunding, No R2/2011, Working Papers "Firms and Region", Fraunhofer Institute for Systems and Innovation Research (ISI),

High Seas MPAs : Regional Approaches and Experiences. United Nations Environment Programme. 12th Global Meeting of the Regional Seas Conventions and Action Plans. Bergen, Norway, 20th-22nd Sept. 2010. <http://www.unep.org/regionalseas/global meetings/12/inf.06-high-seas-side-event.pdf>.

Himes, A. H., (2007b). Performance Indicator Importance in MPA Management Using a MultiCriteria Approach, Coastal Management 35: 601–61.

Hood, Robbie. *Webinar Presentation: NOAA Unmanned Aircraft Systems Program Overview.* <http://uas.noaa.gov/rfp/WebinarPresentation.pdf>. (Accessed February 27, 2012).

"ICCAT: Progress, Yes. Success, No" in PRNewswire: PEW Environmental Source. <www.prnewswire.com/news-release/iccat-progress-yes-success-no.>

IMO. "AIS transponders." IMO International Maritime Organization. 2011.

Implementation of the International Plan of Action to Deter, Prevent and Eliminate Illegal, Unreported, and Unregulated Fishing. Fisheries and Aquaculture Department. FAO Corporate Document Repository. < http://www.fao.org/DOCREP/005/Y3536E/ Y3536E00.HTM>.

International PADI, Inc., "Mooring Buoy Planning Guide" Moorings. <www.inamarmarine.com/pdf/Moorings.pdf> (accessed Jan 30, 2012).

'Ivory Ban Lifted.' <http://news.bbc.co.uk/2/hi/science/nature/276691.stm>.

Jaipaul, Sonia C. "Asset Forfeiture: A Federal Prosecutor's View - Taking the Profit out of White Collar Crime." Federal Bar News and Journal, Vol. 40, Issue 3 (March/April 1993), pp. 176-179.

Jones, George P., Pearlstein, Leonard G., Percival, H. Franklin, "An Assessment of Small Unmanned Aerial Vehicles for Wildlife Research," *Wildlife Society Bulletin*, 34 (2006): 750-758.

Jones, Matthew. "Enforcement of U.S. Fisheries Laws in the EEZ: An Illustration of the Value of the Coast Guard's Deepwater Mission to the Nation and the Need to Provide it With Adequate Deepwater Resources." *Ocean and Coastal Law Journal*, 13 (2007): 281-307.

Joyce, Stephanie. 2000. "The Dead Zones: Oxygen-Starved Coastal Waters". *Environmental Health Perspectives.* 108 (3): A120-A125.

Kennedy, Anthony. “Designing a civil forfeiture system: an issues list for policymakers and legislators.” Assets Recovery Agency, Belfast, UK. *Journal of Financial Crime*, Vol. 13 No. 2 2005 pp. 132-163 Emerald Group Publishing Limited 1359-0790.

Kennedy. *United States v. One Parcel of Property Located at 508 Depot Street, Garretson, Minnehaha County, South Dakota* 964 F.2d 814 (8th Cir, 1992), The case later the US Supreme Court as *Austin v. United States* 113 S. Ct. 2801 (1993).

Kickstarter. Accessed January 16, 2012. <http://www.kickstarter.com/.>

Kite, Geoffrey C., Paul W. C. Green, Nigel C. Veitch, Madeleine C. Groves, Peter E. Gasson, and Monique S. J. Simmonds. "Dalnigrin, a Neoflavonoid Marker for the Identification of Brazilian Rosewood (Dalbergia Nigra) in CITES Enforcement." Phytochemistry 71, no. 10 (7, 2010): 1122-1131.

"Kiva." Kiva. Accessed January 15, 2012. <http://www.kiva.org.>

Kunzig, Robert. “Population 7 Billion,” National Geographic, (January, 2011), http:// ngm.nationalgeographic.com/2011/01/seven-billion/kunzig-text.

Lockwood, John. Interview by Task Force. Seattle, WA, January 17, 2012.

"Long Range Identification and Tracking (LRIT) Overview ." *Navigation Center*. U.S. Coast Guard Navigation Center, n.d. Web. 22 Jan. 2012. <http://www.navcen.uscg.gov/?pageName=lritMain>.

Lucienne Wilma, editor-in-chief, Madagascar Conservation & Development, Vol. 5, Issue 1 (2010): 65.

Mak, Karen K. W., Hideshi Yanase, and Reinhard Renneberg. 2005. Cyanide fishing and cyanide detection in coral reef fish using chemical tests and biosensors. Biosensors & bioelectronics.Vol. 20, No. 12, pp. 2581-2593.

McCay, Bonnie J. and Jones, Peter J.S., “Marine Protected Areas and the Governance of Marine Ecosystems and Fisheries,” *Conservation Biology*, 25 (2011): 1131-1132.

Mikala Peters, “Conservation Report: For the Chumbe Reef Sanctuary & Forest Reserve,” CHICOP (2006):10-13.

M. Lack and G. Sant. “Patagonia Toothfish: Are Conservation and Trade Measures Working? Traffic Bulletion: 2001, pp. 118. <www.worldwildlife.org/what/globalmarkets/wildlifetade.>

Marine Plan of Action Photo. From Kelleher, G., Bleakley, C., and Wells, S., (eds), 1995. WCPA. < http://iucn.org/about/union/commissions/wcpa/wcpa_what/wcpa_marine/ wcpa_marineaction/>.

"Marine Protected Area." AbsoluteAstronomy. 2011. < http://www.absoluteastronomy.com/topics/MarineProtectedArea>.

"Marine Protected Areas in the High Seas." Fisheries and Aquaculture Department. FAO: 2012. < http://www.fao.org/fishery/topic/16204/en>.

"Marine Protected Areas of the World." World Resources Institute. September 25, 2008. <http://www.wri.org/map/marine-protected-areas-world>.

"Maritime Space: Maritime Zones and Maritime Delimitation" <http://www.un.org/depts/los/LEGISLATIONANDTREATIES/status.htm Updated Jan 8 2010>.

Maritime Transportation Security Act of 2002. 46 USC 2101 note. Nov. 25, 2002 [S. 1214] Public Law 107–295 107th Congress. Web.

Mascia, Michael B., "The Human Dimension of Coral Reef Marine Protected Areas: Recent Social Science Research and Its Policy Implications," *Conservation Biology*, 17 (2003), 631.

"Mind the Gap: An Analysis of the Mediterranean Bluefin Trade. Oct. 17, 2011in Global Tuna Conservation produced by the Pew Environmental Group. <www.pewenvironment.org/news-room/other-resources/mindthegap>.

Monster Worldwide: Military.Com, "Marine Protector-class Patrol Boat (WPB)." Accessed March 2, 2012. <http://tech.military.com/equipment/view/131792/marine-protector-class-patrol-boat-(wpb).html>.

Morgan, L., William Chandler, Emily Douce, Sandra Brooke, John Guinotte, and Sarah Myhr. 2010. *Research Priorities for the Pacific Remote Islands Marine National Monument*. Marine Conservation Biology Institute.

"National and Regional Networks of Marine Protected Areas: A Review of Progress." UNEP World Conservation Monitoring Center. UNEP-WCMC Biodiversity Series No. 30. November 2008. < http://www.unep-wcmc.org/medialibrary/2010/09/10/c3addefe/MPA_report.pdf>.

National Oceanic and Atmospheric Administration. "USCG/NOAA Automatic Identification System (AIS) on Data Buoys and C-MAN Stations." *Sector Puget Sound Vessel Traffic Service*. United States Coast Guard, 26 Sept. 2004. Web. 17 Jan. 2012. <www.uscg.mil/d13/psvts/docs/aissrsfinal.pdf>.

Nellemann, C., Stefan Hain, and Jackie Alder. 2008. *In dead water: merging of climate change with pollution, over-harvest, and infestations in the world's fishing grounds*. Arendal, Norway: United Nations Environment Programme, GRID-Arendal.

Nguyen Hai An, "*Assessment of MPA management: Using Analytic Hierarchy Process to analyze stakeholder preferences for performance indicators in Nha Trang Bay MPA, Vietnam*" (PhD diss, Master Thesis in Fisheries and Aquaculture Management and Economics, The Norwegian College of Fishery Science, University of Tromso, Norway & Nha Trang University, Vietnam).

NOAA. "aUSCG/NOAA Automatic Identification System (AIS) on Dta Buoys and C-MAN Stations." *Sector Puget Sound Vessel Traffic Service*. United States Coast Guard, 26 Sept. 2004. Web. 17 Jan. 2012.

NOAA Coastal Services Center. "Marine Protected Areas Technology Needs Assessment." NOAA. December 2003.

NOAA Coral Reef Conservation Program, "Pollution threats." Last modified May 13, 2011. <http://coralreef.noaa.gov/threats/pollution/.>

NOAA Fisheries Service. "Electronic Monitoring System Technology." A Pilot Study: Documenting andd Estimating Catch on Commercial Fishing Vessels Using Elctronic Monitoring System (EMS) Technology. <www.gmri.org/upload/files/EMS_Monitoring_Panel_Presentation.pdf (accessed February 29, 2012)>.

NOAA. Policy on Prohibited and Approved Uses of the Asset Forfeiture Fund. March 16, 2011. Web.

NOAA Office of Law Enforcement. "Leveraging Technology and teh Vessel Monitoring System (VMS)." NOAA . <http://www.nmfs.noaa.gov/ole/vms.html> (accessed Jan 19, 2012).

Ocean Power Technologies, INC.. "PB150 PowerBuoy." Ocean Power Technologies. <http://www.oceanpowertechnologies.com/pb150.htm> (accessed Jan 18, 2012).

Oliver, Pere and Rebecca Metzner. FAO.2005-2012. World inventory of fisheries. Impacts of fishery activities. Issues Fact Sheets. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 27 May 2005. [Cited 29 January 2012]. http://www.fao.org/fishery/topic/12273/en.

Ostrom, Olstrom. Governing the Commons. Cambridge: University of Cambridge Press, 1990.

Paul Hilton. *Shark Fin Soup and the Conservation Challenge.* Time Magazine. Aug 9, 2010, available at <http://www.time.com/time/magazine/article/0,9171,2021071,00.html>.

Peters, H., and J.P. Hawkins. 2009. "Access to marine parks: A comparative study in willingness to pay". *Ocean and Coastal Management.* 52 (3-4): 219-228.

Peters, Mikala. "Conservation Report: For the Chumbe Reef Sanctuary & Forest Reserve," CHICOP (2006):10-13.

"Phoenix Islands Protected Area: Management Plan 2009-2014." Kiribati: 2008.

Pomeroy, R. S., and Rebecca Rivera-Guieb. 2005.Fishery co-management a practical handbook. Wallingford, Oxfordshire [England]: CABI Pub.< http://site.ebrary.com/id/10119722.>

PRCM. "New Means and Strategy for the Marine Surveillance of MPAs in the Bijagos Archipelago." West African Regional Maritime and Coastal Conservation Programme PRCM. 2010. <http://en.prcmarine.org/index.php?option=com_content&view=article&catid=51%3Aactualit&id=920%3Anew-means-and-strategy-for-the-marine-surveillance-of-mpas-in-the-bijagos-archipelago&Itemid=226> (accessed Jan 26, 2012).

Press Release, Intl Union for the Conservation of Nature, 'Third of Open Ocean Sharks Threatened With Extinction.' <http://www.iucn.org/?3362/Third-of-open-ocean-sharks-threatened-with-extinction>.

Proceeds of Crime Act 202, s 242 (UK) cited in Kennedy, Anthony "Designing a civil forfeiture system: an issues list for policymakers and legislators" Assets Recovery Agency, Belfast, UK. Journal of Financial Crime, Vol. 13 No. 2 2005 pp. 132-163 Emerald Group Publishing Limited 1359-0790.

Proc. of High Seas Marine Protected Areas: Safeguarding Areas Beyond National Jurisdiction, Washington DC. District of Columbia Bar, Environment, Energy, and Natural Resources Section. Web. 31 Jan. 2012. <http://www.eli.org/pdf/seminars/12.16.10dc/12.16.10dcsummary.pdf>.

Reid-Grant, Kimesha and Bhat, Mahadev, "Financing marine protected areas in Jamica: An exploratory study," *Marine Policy*, 33 (2009): 129 – 130.

Renee Martin-Nagle. "Current Legal Developments: Convention on Trade in Endangered Species (CITES)." *The International Journal of Marine and Coastal Law 25* (2010) 609-620.

'Reports to Congress Pursuant to the Shark Finning Prohibition Act of 2000.' Accessed Feb 20 2012. NOAA fisheries. <http://www.nmfs.noaa.gov/ia/intlbycatch/rpts_shark_finning.htm>.

Richard Bruné, "CITES Regulation of Brazilian Rosewood," Soundboard, 1992, 31-32.

Richmond, Robert H. "Coral Reef Resources: Pollution's Impacts," *Forum for Applied Research and Public Policy* (Spring 1994).

Riedmiller, Sibylle. "The Chumbe Island Coral Park Project: Management Experiences of a Private Marine Conservation Project," ICRI-International Tropical Marine Ecosystems Management Symposium (1998), <http://www.reefed.edu.au/__data/assets/pdf_file/0006/1878/itmems_222-235_s05_3.pdf.>

Sala, Enric. Interview by Task Force. Videoconference. Seattle, WA. January 10, 2012.

Salm, Rodney V., Clark, John R. and Siirila, Erikki, *Marine and Coastal Protected Areas: A Guide for Planners, Third Edition*, (Gland, Switzerland: IUCN, 2000).

Sanchirico, J. N., & J. E. Willen, (2001). A bioeconomic model of marine reserve creation, Journal of Environmental Economics and Management 42: 257-27.

Sanctuaries Web Team, Revised June 07, 2011. Office of National Marine Sanctuaries National Marine Sanctuaries. (See sections 306, 307, and 312 of National Marine Sanctuary Act).

Satellite Imaging Corporation, "SENTINEL-3 ESA'S NEXT GENERATION SATELLITE SCHEDULED TO LAUNCH IN 2013." Last modified September 29th, 2009. Accessed March 3, 2012. <http://news.satimagingcorp.com>.

"Science, funding and participation: key issues for marine protected area networks and the Coral Triangle Initiative". 2009. *Environmental Conservation.* 36 (2): 91-96.

Schwarte, Christoph, and Linda Siegele. 2008. *Marine Protected Areas on the High Seas?: An introductory guide to the legal issues surrounding the establishment of marine protected areas on the high seas*. United Kingdom: FIELD, Foundation for International Environmental Law and Development. <http://www.field.org.uk/files/Marine_protected_areas_screen.pdf.>

Sea Watch. "Vessel Monitoring System." Sea Watch. <http://www.seawatch.org/solution/vms position paper.php>. Accessed Jan 23, 2012.

Sibylle Riedmiller, "The Chumbe Island Coral Park Project: Management Experiences of a Private Marine Conservation Project," *ICRI-International Tropical Marine Ecosystems Management Symposium* (1998), <http://www.reefed.edu.au/__data/assets/pdf_file/0006/1878/itmems_222-235_s05_3.pdf>.

Socio-Economic Effects and Constraints in Tropical Forest Management. the Results of an Enquiry Organized by the International Federation of Institutes for Advanced Study, Edited by J. E. M. Arnold. Chichester: John Wiley & Sons Limited, 1982.

Stevens, Jane. 10/27/2007. "12 Giant Bluefin Tagged in New Zealand!" comment on "Tagging of Pacific Predators Project Blog". <http://topp.org/>.

Stolsvik, Gunnar. "Illegal Fishing Crosses Borders—So Must Law Enforcement." February 18, 2011. CFP Reform Watch. Web. <http://www.cfp-reformwatch.eu/2011/02/illegal-fishing-crosses-borders-–-so-must-law-enforcement.>

"Stretching Your MPA Budget: How to Do More With Less Funding". 2002. *MPA News.*

Svensson, Patrik, Rodwell, Lynda D., and Attrill, Martin J., "Privately Managed Marine Reserves as a Mechanism for the Conservation of Coral Reef Ecosystems: A Case Study from Vietnam," *Ambio,* 38 (2009): 72.

Timeon, Ioataake. Maneaba ni Maungatabu, "Phoenix Islands Protected Area Management Plan 2010-2014." Accessed January 31, 2012. <http://www.phoenixislands.org/pdf/2010-2014_FINAL_PIPA_Management_Plan.pdf.>

The Coral Reef Alliance, "Coastal Development:planning for a sustainable reef." Last modified 2005. Accessed January 30, 2012.< http://www.coral.org/node/128.>

"The End of Brazilian Rosewood (Cancellation of all but Two Mahogany Logging Operations in the Amazon)." American Rag, Vol. 14, 2002, <http://search.ebscohost.com/login.aspx?direct=true&db=mah&AN=MAH0001172634&site=ehost-live.>

"The Environmental Consequences of Guitar Making: The Present and the Future." Musical Merchandise Review 168, no. 10 (10, 2009): 34-45, <http://search.ebscohost.com/login.aspx?direct=true&db=mah&AN=46739494&site=ehost-live.>

Thompson M.H., Dumont C.P., Gaymer C.F. ISO 14001: Towards international quality environmental management standards for marine protected areas (2008) Ocean and Coastal Management, 51 (11) , pp. 727-739.

Thur, S.M. 2010. "User fees as sustainable financing mechanisms for marine protected areas: An application to the Bonaire National Marine Park". *Marine Policy.* 34 (1): 63-69.

Tietze, Uwe. 2005. *Economic performance and fishing efficiency of marine capture fisheries.* Rome: Food and Agriculture Organization of the United Nations.

"Tools and Strategies for Financial Sustainability: How Managers Are Building Secure Futures for Their MPAs". 2003. *MPA News*. 5(5).

Tobey, J., and E. Torell. 2006. "Coastal poverty and MPA management in mainland Tanzania and Zanzibar". *Ocean and Coastal Management.* 49 (11): 834-854.

Toribio, Maria (USAID). *Cost-Benefit Study of Marine-Protected Areas: Implications of Financing and Institutional Needs*. The Philippines.

Trond Bjorndal "The East Atlantic Bluefin Tuna Fisheries: Stock Collapse or Recovery?" *Marine Resource Economics.* Vol 21 pp. 193-210. 2006.

UNCLOS. Articles 56, 92, 117, & 118. <www.un.org/depts/los/convention_agreements/texts/unclos_e.pdf>.

UNEP/GPA 2006a. *The State of the Marine Environment: Trends and processes.* The Hauge

UNEP. 2010. *UNEP Emerging Issues: Environmental Consequences of Ocean Acidification: A Threat to Food Security*. United Nations Environment Programme.

UN FAO Fisheries. *State of World Fisheries and Aquaculture* 2002. <www.fao.org/fi/default.asp>.

UN Fish Stocks Agreement. <www.un.org/depts/los/conventions_agreements/texts/fish_stocks_agreement/CONF164_37.htm>.

United Nations Conference on Environment and Development Rio de Janeiro 1992. Agenda 21. Chapter 17 pg 45. <www.un.org/esa/dsd/agenda21/>.

United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances, United Nations 1988. Vienna, Italy.

United Nations Convention Against Transnational Organized Crime, United Nations 2000. Palermo, Italy.

United Nations. *United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances.* 1988. Vienna, Italy. Web.

United Nations. *United Nations Convention Against Transnational Organized Crime*. 2000. Palermo, Italy. Web.

United States Coast Guard. "Aircraft and Cutters: 25-foot Defender Class Boat." <http://www.uscg.mil/datasheet/25rbs.asp> (Accessed March 2, 2012.)

United States Coast Guard, "Unmanned Aircraft Systems Features." Last modified January 26, 2012. Accessed March 2, 2012. <http://www.uscg.mil/acquisition/uas/features.asp>.

U.S. Congressional Research Service. *U.S. Unmanned Aerial Systems.* by Jeremiah Gertler. Washington: 2012.

U.S. Congressional Research Service. *U.S. Unmanned Aerial Vehicles: Background and Issues for Congress* by Harland Greer and Christopher Bolkcom. Washington: 2005.

U.S. Department of Defense. *Dictionary of Defense.* <http://www.dtic.mil/doctrine/dod_dictionary/data/u/18956.html> (Accessed February 27, 2012).

U.S. Department of Justice, "Selected Federal Asset Forfeiture Statutes." 2006. Web. <http://www.justice.gov/criminal/foia/docs/afstats06.pdf.> *Amended*: Sustainable Fisheries Act, Pub L 104-297, Title I, § 114(d), Oct 11, 1996, 110 Stat. 3559, 3599. & *Enacted:* Fisheries Act of 1995, Pub L. 104-43, Title I, § 110, Nov. 3, 1995, 109 Stat. 366, 375.

"Use of Volunteers in MPA Management: Opportunities, Challenges, and Advice". 2006. *MPA News*. 7(8).

U.S. Library of Congress. Congressional Research Service. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance* by Christopher Bolkcom and Blaz Nunez-Neto. Washington: 2008.

U.S. Library of Congress. Congressional Research Service. *Unmanned Aerial Vehicles: Background and Issues for Congress.* by Elizabeth Bone and Christopher Bolkom. Washington: 2003.

VanderZwaag, David L., and Paul MacNab, ed. Canada: International Union for the Conservation of Nature, 2009. s.v. "Marine Protected Areas: Legal Framework for the Gully off the Coast of Nova Scotia (Canada)." http://cmsdata.iucn.org/downloads/the_gully.pdf (accessed January 31, 2012).

Vanzella-Khouri, Allesandra. "Challenge Facing MPAs in the Carribean: Lack of Political Will." 2011.MPA News. 12(6).

Various Articles. ProtectPlanetOcean. 2010. <http://www.protectplanet ocean. org/collections/introduction/introbox/whyweneed/introduction-item.html>.

Wabnitz, C., Taylor, M., Green, E., Razak, T. 2003. *From Ocean to Aquarium*. UNEP-WCMC, Cambridge, UK. <http://www.unep-wcmc.org/resources/publications/UNEP_WCMC_bio_series/17.htm>.

"What Are Marine Protected Areas?" Office of Ocean and Coastal Resource Management, NOAA Ocean Service. Silver Spring, MD 20910, U.S.A. April, 2011. <http://www.mpa.gov. offcampus.lib.washington.edu/pdf/helpful- resources /us_mpas_snapshot.pdf>.

"What Is IUU Fishing and Marine Living Resource Crime?" Www.fisheries.no. The Norwegian Ministry of Fisheries and Coastal Affairs, 24 Oct. 2011. Web. 31 Jan. 2012. <http://www.fisheries.no/resource_management/control_monitoring_surveillance/IUU_fishing_definition/>.

"What Is Microfinance?" CGAP. Accessed January 15, 2012. "CGAP is an independent policy and research center dedicated to advancing financial access for the world's poor." <http://cgap.org/p/site/c/template.rc/1.26.1302.>

Wilkinson, Clive et. al., *A practical guide on how monitoring can support effective management of MPAs,* Australian Institute of Marine Science, 4-7.

Wilma, Lucienne. editor-in-chief. Madagascar Conservation & Development, Vol. 5, Issue 1 (2010): 65.

"Working with Developing Countries," Marine Stewardship Council, http://www.msc.org/about-us/credibility/working-with-developing-countries/working-with-developing-countries.

World database of protected areas. United Nations Environment Programme: World Conservation Monitoring Centre. 2009. <http://www.wdpamarine.org/Default.aspx#/countries/about>.

World Summit of Sustainable Development Plan of Implementation Johannesburg 2002. Chapter 4 pg. 18, Section 32.c . <www.un.org/esa/sustdev/documents/WSSD_POI_PD/WSSD_PlanImpl.pdf.>

World Wild Life. “Corals”. 2006. <http://worldwildlife.org/coral/> (2 December 2006).

Worm, et al. (2006) "Impacts of biodiversity loss on ocean ecosystem services". Science, 314 (5800), p787.WTO Analytical Index: Technical Barriers, “Agreement on Barriers to Trade,” World Trade Organization, http://www.wto.org/english/res_e/booksp_e/analytic_index_e/tbt_02_e.htm (accessed January 21, 2012).

WTO Analytical Index: Technical Barriers, “Agreement on Barriers to Trade,” World Trade Organization,<http://www.wto.org/english/res_e/booksp_e/analytic_index_e/tbt_02_e.htm> (accessed January 21, 2012).

Yochim, Jaysen. *THE VULNERABILITIES OF UNMANNED AIRCRAFT SYSTEM COMMON DATA LINKS TO ELECTRONIC ATTACK*. Fort Leavenworth, Kansas: U.S. Army Command and General Staff College, 2010. <http://www.fas.org/irp/program/collect/uas-vuln.pdf>. (Accessed February 27, 2012.)

Zaloga, Steven J., Rockwell, David, Finnegan, Philip. “World Unmanned Aerial Vehicles: 2011 Market Profile and Forecast.” Teal Group Corporation: Fairfax, VA.

Zinser, Todd J. KPMG “Final Report: Forensic Audit Services Relating to the NOAA Fisheries Fund.” July 1, 2010. Web. <http://www.fear.org/ig_report_aff.pdf>.

Zubi, Teresa. Starfish, "Ecology: Reefs at Risk." Last modified May 21, 2009. Accessed January 30, 2012. <http://www.starfish.ch/reef/conservation.html.>