

Workshop on Ecosystem-Based Fisheries Management

NEFMC

Scientific and Statistical Committee

26 – 27 August 2009

Outline

- Development of EAM Framework
- Test of EAM Framework

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- Test of EAM Framework

DFO Authority

- *Fisheries Act* gives DFO regulatory authority over fisheries
- *Oceans Act* gives DFO lead role in managing the effects of human activities on marine waters
 - Lead & facilitate management planning process that includes other regulatory agencies

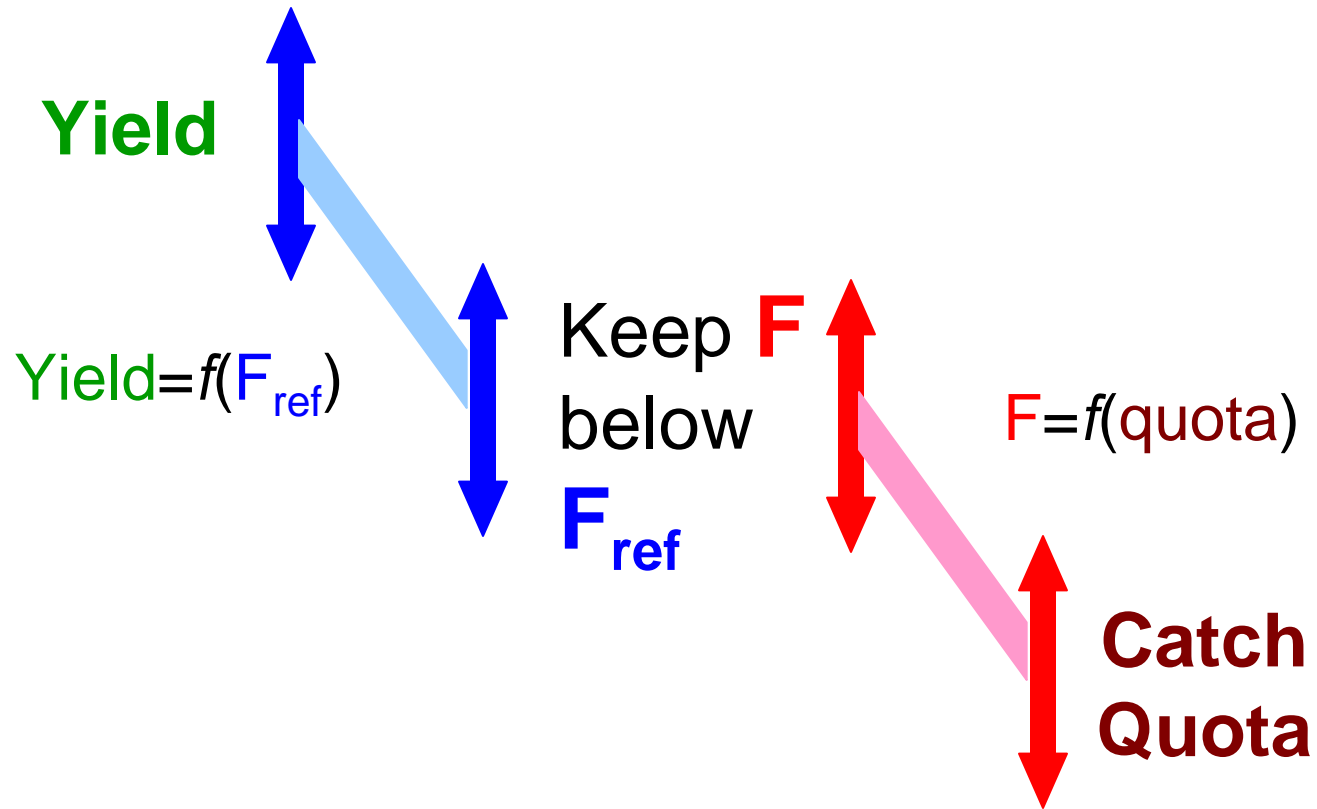
What does EAM mean for fisheries

- In addition to concern about impacts of fishing on harvested resources
 - Impacts of fishing on components of ecosystem other than harvested resources
 - Implications of environmental forces and prevailing ecosystem conditions on how fishing is conducted

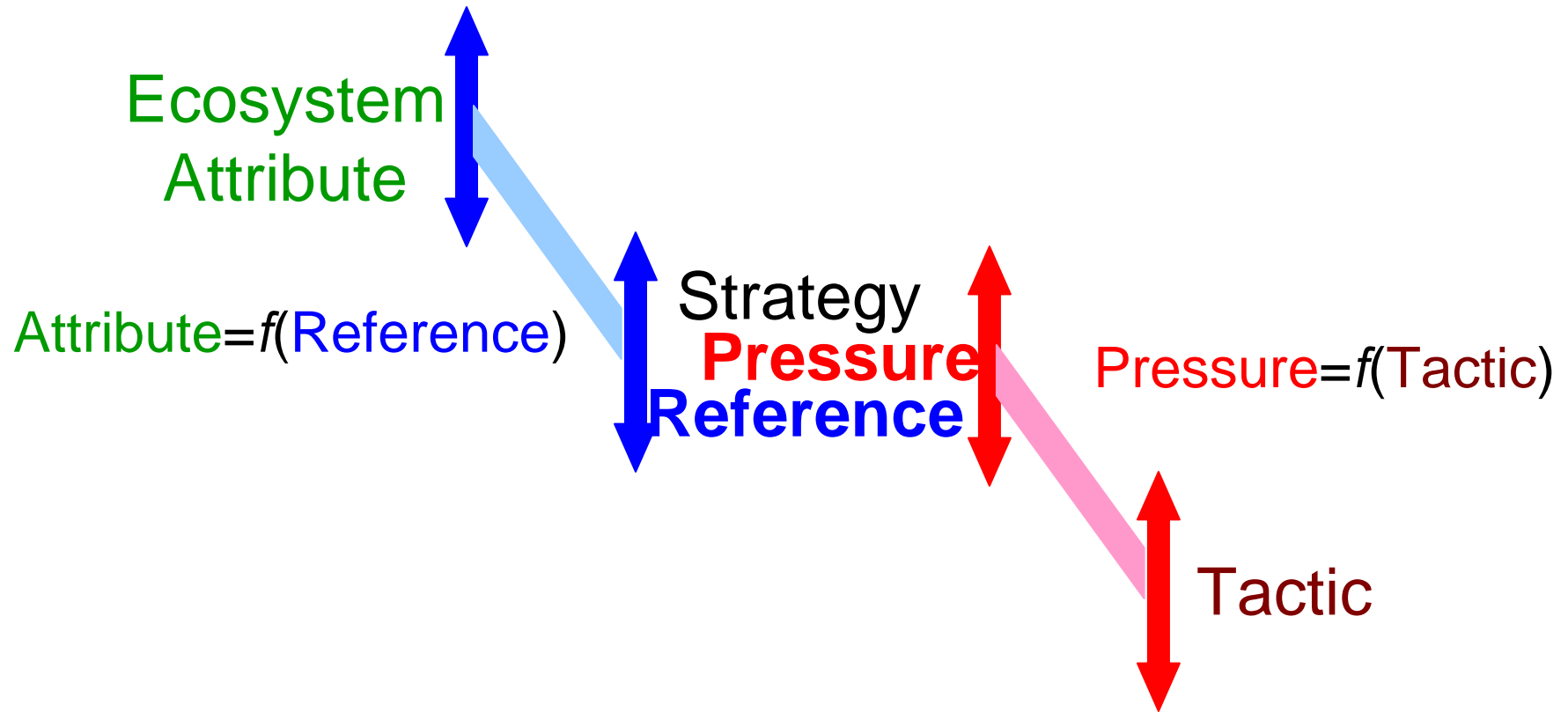
EAM Framework

- Build on traditional fisheries management
- Prevalent motivation of traditional fisheries management
 - controlling exploitation of harvested resources
 - use as paradigm on which to model how traditional management can be extended

Do not cause unacceptable reduction of productivity



Linkages



Management Planning

Objective

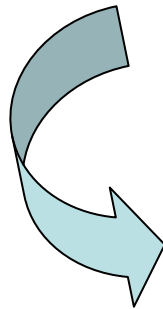
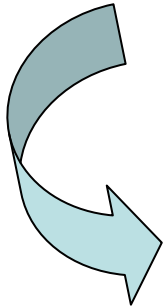
- attribute (yield)

Strategy

- ‘WHAT’ will be done
 - Keep fishing mortality below 0.2

Tactic

- ‘HOW’ it will be done
 - Catch quota



Objectives

- Conservation
- Economic
- Social & cultural

Conservation Objectives

- **Maintain Productivity**
 - do not cause unacceptable reduction in productivity so that components can play their role in the functioning of the ecosystem
- **Preserve Biodiversity**
 - do not cause unacceptable reduction in biodiversity in order to preserve the structure and natural resilience of the ecosystem
- **Protect Habitat**
 - do not cause unacceptable modification to habitat in order to safeguard both physical and chemical properties of the ecosystem

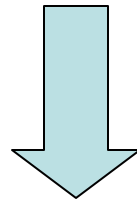
Strategies & Attributes

ATTRIBUTES	OBJECTIVES STRATEGIES with associated pressures	MANAGED ACTIVITIES				TACTICS
EXPANSION OF ATTRIBUTES CONSIDERED yield biomass recruitment size/age structure spatial extent spatial occupancy population richness predator forage community assemblage size spectrum trophic structure 'special species' habitat type spectrum 'special places' breeding behavior organism health	Productivity: do not cause unacceptable reduction in productivity so that components can play their role in the functioning of the ecosystem	Groundfish Fishery	Herring Fishery	Salmon Aquaculture	etc.	
	<ul style="list-style-type: none"> Keep fishing mortality moderate - Promote positive biomass change when biomass is low - Manage discards for all harvested species Allow sufficient escapement from exploitation of spawning biomass Limit disturbing activity in spawning areas/seasons Control alteration of nutrient concentrations affecting primary production at the base of the food chain by algae 		↑			
	Biodiversity: do not cause unacceptable reduction in biodiversity in order to preserve the structure and natural resilience of the ecosystem		←	CUMULATIVE EFFECTS	→	
	<ul style="list-style-type: none"> Control incidental mortality for all non-harvested species Minimize unintended transmission of invasive species Distribute population component mortality in relation to component biomass 			EXPANSION OF		
	Habitat: do not cause unacceptable modification to habitat in order to safeguard both physical and chemical properties of the ecosystem			↓		
	<ul style="list-style-type: none"> Manage area disturbed of bottom habitat Limit introduction of pollutants in habitat Minimize deaths from structures/equipment/lost gear Control noise and light disturbance 					

catch control
 effort control
 gear specification,
 size-based release
 area/season closure
 ballast water control

Incremental Evolution

Traditional Fisheries Management



Ecosystem Approach

- triage, priorities, tractable
- institutional preparedness/sector capacity
- additional integrative levels

Implementation

- Framework
 - Common basis
 - No intent to draft an Ecosystem Plan
 - Implement through Fisheries Management Plans
- 7 Actions Steps

Outline

- Development of EAM Framework
- **Test of EAM Framework**

Pilot: Georges Bank Fisheries

- Test application of Action Steps from Framework
- **Work in progress, not completed**
 - DFO developing example for review with fishing industry and other stakeholders
 - Results/summaries will be altered/modified as work progresses
 - Only to illustrate process and experience on work to date

Step 2

- List activities occurring in each EAM area that are managed by DFO, or subject to DFO purview under the Oceans Act, Species at Risk Act or Canadian Environmental assessment Act, and identify the *[management unit]* for those activities as well as the management authority.

Fishing activities in 5Zc

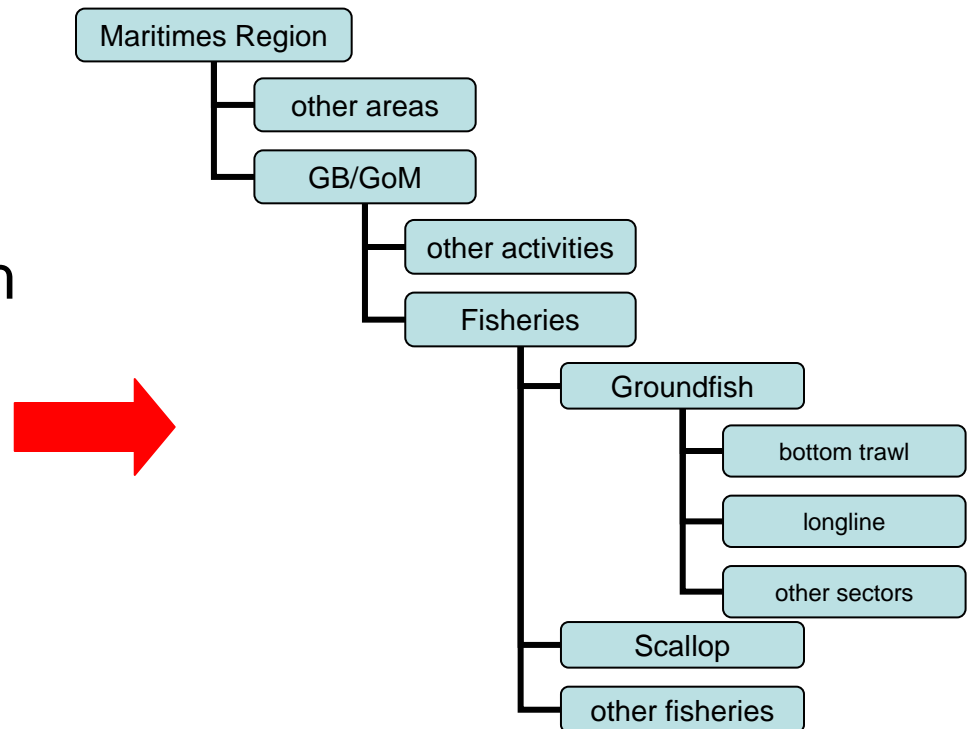
Activity	Activity Code	Management Authority
groundfish bottom trawl	GRO-OTB	DFO
groundfish longline	GRO-LLS	DFO
groundfish handline	GRO-LHP	DFO
groundfish gillnet	GRO-GNS	DFO
yellowtail flounder bottom trawl	YTF-OTB	DFO
offshore scallop dredge	SCA-DR	DFO
offshore lobster trap	LBA-FPO	DFO
red crab trap	CRR-FPO	DFO
swordfish/other tuna longline	SWO-LL	DFO
swordfish/other tuna harpoon	SWO-HAR	DFO
bluefin tuna angling	BFT-LTL	DFO
bluefin tuna tended line	BFT-LHP	DFO
bluefin tuna harpoon	BFT-HAR	DFO
herring purse seine	HER-PS	DFO
herring midwater trawl	HER-OTM	DFO

Step 1

- Review and reform management committees as required by EAM and develop mandates with clear statements of expected products. Promote the building of capacity within stakeholder groups to participate in the process.

Advisory Committees

- Maritimes Roundtable
- Gulf of Maine
- Scotia-Fundy Groundfish
- Offshore Scallop
- Offshore Lobster & Jonah Crab
- Red Crab
- Herring
- Large Pelagics



Step 3

- For each activity, review the list of strategies and identify/prioritize the key pressures it exerts. Establish a way to measure the pressures, or a reasonable proxy of them, using the best available information. *[identified management units here, associated with pressure to be managed]*

Productivity

	Management Unit	Activities												
		GRO-OTB	GRO-LLS/LHP	GRO-GNS	YTF-OTB	SCA-DR	LBA-FPO	CRR-FPO	SWO-LL	SWO-HAR	BFT-L/TL/LHP	BFT-HAR	HER-PS	HER-OTM
<u>Strategies with associated pressures</u>														
Keep <u>fishing mortality</u> moderate	5Zjm COD	√	√	√	√	√	√							
	5Zjm HAD	√	√	√	√	√								√
	5Zhjmn YTF	√	√	√	√	√								
	4X5Zc POL	√	√	√	√									
	3NOPs4VWX5Zc HAL	√	√											
	GB-A SCA					√								
	GB-B SCA					√								
	LFA41 LBA	√				√	√							√
	NA SWO							√	√					
	NA other tuna?							√						
	NWA BFT							√		√				
	GB HER											√	√	
<u>Allow sufficient escapement from exploitation of spawning biomass</u>	LFA41 LBA						√							
	LFA41 CRR							√						
<u>Limit disturbing activity in spawning areas/seasons</u>	5Zjm COD	√	√	√	√	√								
	5Zjm HAD	√	√	√	√									
<u>Control alteration of nutrient concentrations affecting primary production at the base of the food chain by algae</u>														

Key pressures

Contributing activities

Degree of contribution?

Managed?

Step 4

- Identify the valued ecosystem attributes impacted by the pressures and establish appropriate operational reference points for the pressures or their proxies to control their impact. *[and from Step 3 ‘a way to measure the pressures’]*

Pressures, References, Attributes Productivity

<u>Strategies with associated pressures</u>	<u>Management Unit</u>	<u>Measure of pressure</u>	<u>Reference</u>	<u>Attributes</u>
Keep <u>fishing mortality</u> moderate	5Zjm COD	F (VPA)	F=0.18	} <i>yield, biomass, recruitment, size/age structure, spatial occupancy, predator forage, trophic structure</i>
	5Zjm HAD	F (VPA)	F=0.26	
	5Zhjmn YTF	F (VPA)	F=0.25	
	4X5Zc POL	F (VPA)	F=0.2	
	3NOPs4VWX5Zc HAL	F (tagging)	F=0.09	
	GB-A SCA			
	GB-B SCA			
	LFA41 LBA	F (various)	F<tradition	
	NA SWO			
	NA other tuna?			
	NWA BFT			
	GB HER			
<u>Allow sufficient escapement from exploitation of spawning biomass</u>	LFA41 LBA	expl. rate on females	<50%	
	LFA41 CRR	expl. rate on females	0%	
Limit <u>disturbing activity</u> in spawning areas/seasons	5Zjm COD	presence	no activity	<i>recruitment, breeding behavior</i>
	5Zjm HAD	presence	no activity	<i>recruitment, breeding behavior</i>
<u>Control alteration of nutrient concentrations</u> affecting primary production at the base of the food chain by algae				

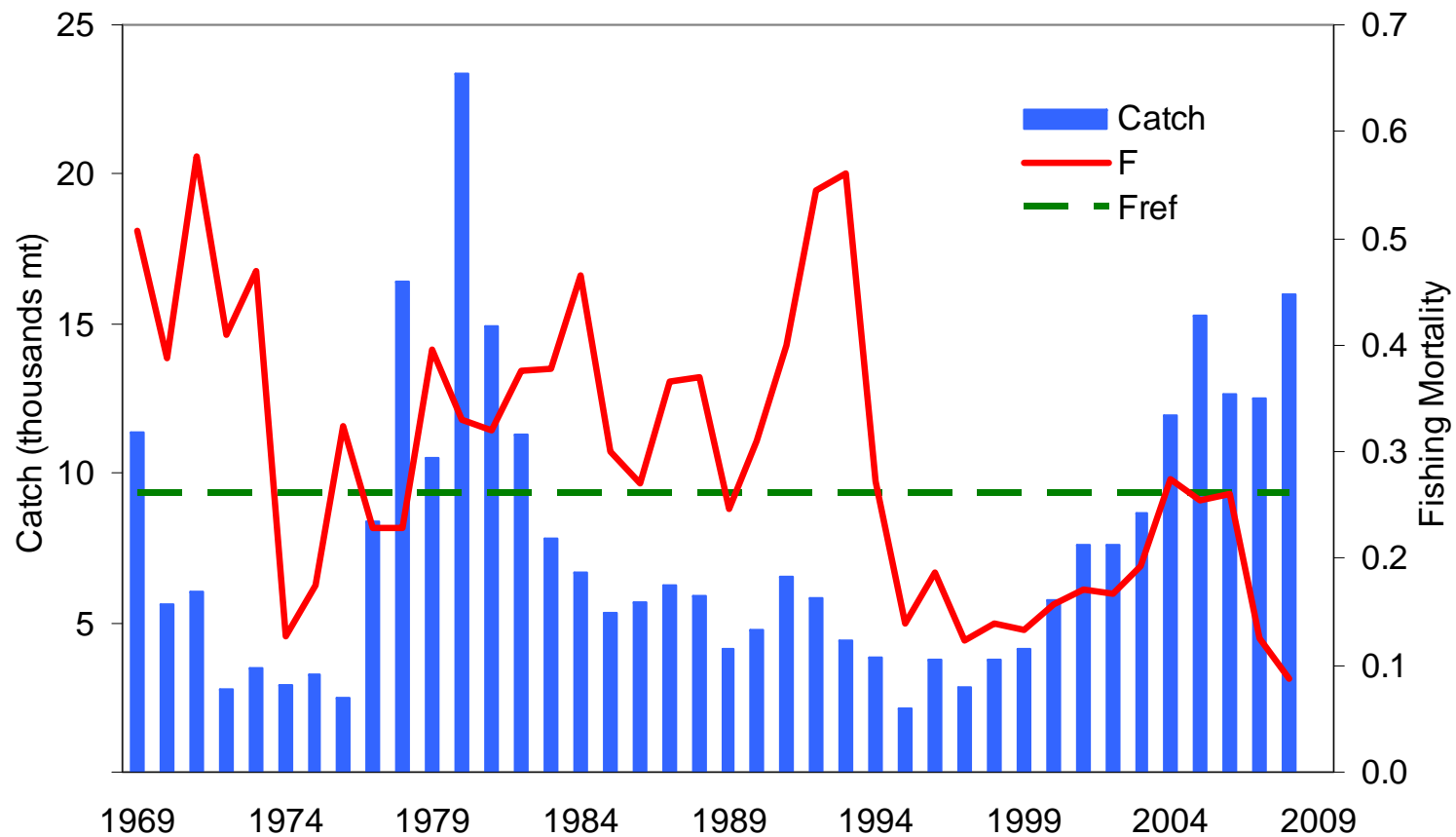
Pressures, References, Attributes Biodiversity & Habitat

<u>Strategies with associated pressures</u>	<u>Management Unit</u>	<u>Measure of pressure</u>	<u>Reference</u>	<u>Attributes</u>
Control <u>incidental mortality</u> for all non-harvested species	4X5Zc white hake	landings	traditional	<i>heuristic</i>
	4VWX5Zc cusk	catch	biomass recovery	<i>biomass, recruitment, size/age structure, spatial occupancy, trophic structure</i>
	Atlantic wolfish	landings	traditional	<i>heuristic</i>
	spotted wolfish	landings	traditional	<i>heuristic</i>
	other flounders	landings	traditional	<i>heuristic</i>
	winter skate			
	thorny skate			
	barndoor skate			
	smooth skate			
	blue shark			
basking shark				
porbeagle shark				
Minimize <u>unintended transmission</u> of invasive species				
Distribute population component mortality in relation to component biomass				
<u>Manage area disturbed</u> of bottom habitat	Coral Conservation Area	presence	no activity	<i>'special places'</i>
Limit <u>introduction of pollutants</u> in habitat				
Minimize <u>deaths from structures/equipment/lost gear</u>				
Control <u>noise and light disturbance</u>				

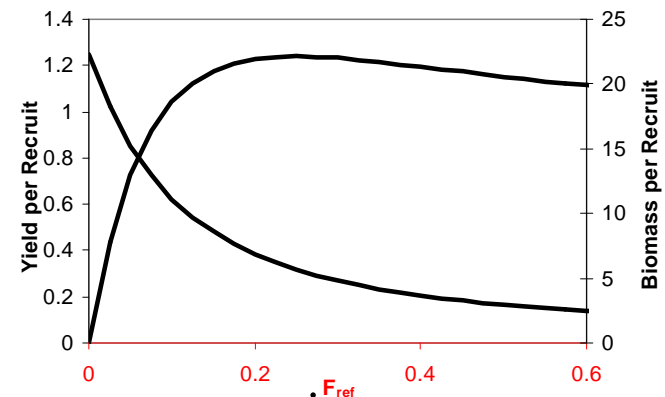
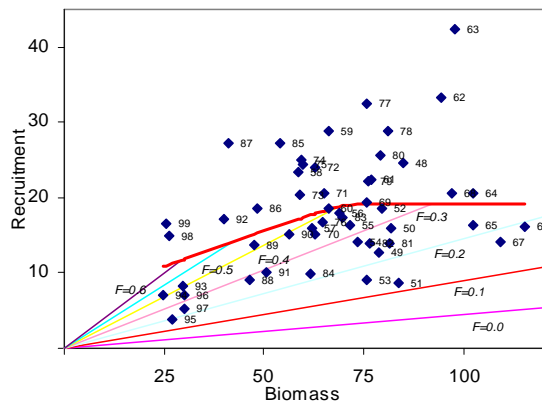
Step 5 : Incorporate strategies in plans or regulations for all key pressure.

- Review fisheries management plans to evaluate if they include strategies to address key pressures
 - e.g. “maintain a low to neutral risk of exceeding the fishing mortality limit reference, $F_{ref} = 0.26$. When stock conditions are poor, fishing mortality rates should be further reduced to promote rebuilding.”
(source: TMGC)
- Propose options to address gaps

Step 6 : Conduct performance evaluations regularly to determine if tactics are effective at keeping pressures within established reference. Adjust tactics as required. Remedy identified gaps in fishery or ecosystem monitoring that inhibit performance evaluation of the tactics.



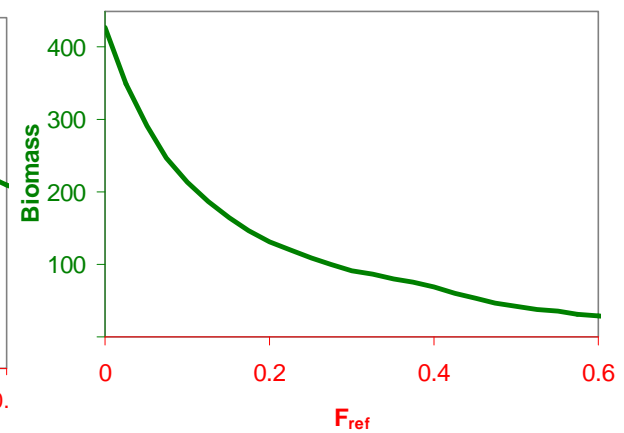
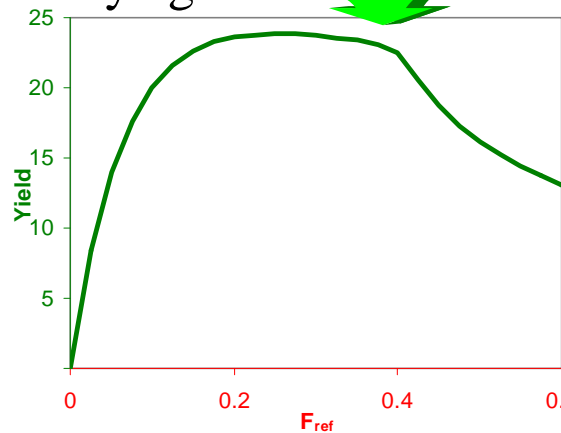
Step 7 : Periodically determine if impacts on valued ecosystem attributes are unacceptable. Initiate science review and consultations to revise reference points and/or strategies as required. Remedy identified gaps in fishery or ecosystem monitoring that inhibit performance evaluation of reference points.



growth
fishery exploitation pattern by age
natural mortality



recruitment



Science Support

- Establish relationships
 - Tactical Decisions
 - $\text{Pressure} = f(\text{tactic}, \text{status})$
 - Strategic Decisions
 - $\text{Attribute} = f(\text{pressure reference}, \text{non-fishery forces})$
- Develop ways to measure pressures or proxies
- Identify candidate references for pressures
- Conduct performance evaluation
 - Tactics
 - Strategies

What does EAM mean for fisheries

- In addition to concern about impacts of fishing on harvested resources
 - Impacts of fishing on components of ecosystem other than harvested resources
 - Manage by-catch & bottom contact; consider impacts on additional ecosystem attributes
 - Implications of environmental forces and prevailing ecosystem conditions on how fishing is conducted
 - Review references wrt changes in growth, mortality, species interactions, etc.