

# Ecosystem Based Management

Fisheries

# What is Ecosystem Based Management

- **Manage human activities** to:
  - Control impact on ecosystem
    - e.g. effect of catch removals
  - Recognize ecosystem influence on how we conduct activity
    - e.g. temperature  $\Rightarrow$  growth  $\Rightarrow F_{\text{ref}}$

# Why Ecosystem Based Management

- Manage impacts of human activities on all ecosystem components, not just on the harvested resources
- Integrate the cumulative effects from human activities across all sectors

# What Has Been Done

- 1995: Integrated Fisheries Management Planning
- 2000: Objectives Based Fisheries Management
- 2000s: Ecosystem Based Fisheries Management
- present: Integrated Management

# Conceptual Ecosystem Conservation Objectives

- **Maintain Productivity**

- do not cause unacceptable reduction in productivity so that components can play their historical 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

# Strategy ↔ Operational Objective

- Action
- Performance Indicator
- Reference Point
- Associated tactical management measure
- Keep fishing mortality below 0.2 using TAC

# Where Have We Come From?

- Keep fishing mortality moderate
- Promote positive biomass change when biomass is low
- Distribute population component mortality as a % of component biomass
- Limit by-catch to 10% of total catch
- Restrict bottom-impacting fishing in the coral conservation area

# Where Are We Going?

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## Strategies (performance indicator)

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### **Productivity**

#### Primary Productivity

- Control alteration of **nutrient concentrations** affecting primary production at the base of the food chain by algae

#### Community Productivity

- Manage **trophic level removals** taking into account consumption requirements of higher trophic levels
- Manage **total removals** taking into account system production capacity

#### Population Productivity

- Keep **fishing mortality** moderate
- Allow sufficient **spawning biomass** to escape exploitation
- Promote positive **biomass change** when biomass is low
- Target **% size/age/sex** of capture to avoid wastage
- Limit disturbing **activity in spawning areas/seasons**
- Manage **discarded catch** for all harvested species

### **Biodiversity**

#### Species Diversity

- Control **incidental mortality** for all non-harvested species
- Minimize **change in distribution** of invasive species

#### Population Diversity

- Distribute population **component mortality in relation to component biomass**

### **Habitat**

- Manage **area disturbed** of bottom habitat types
  - Limit **amounts of contaminants, toxins and waste** introduced in habitat
  - Minimize **amount of lost gear**
  - Control **noise or light level/frequency**
-

# EBM

2 dimensions  
are fundamental

Managed Activity

Groundfish Fishery    Herring Fishery    Salmon Aquaculture    etc

	Strategies (performance indicator)
<b>Productivity</b>	
<u>Primary Productivity</u>	<ul style="list-style-type: none"> <li>Control alteration of <b>nutrient concentrations</b> affecting primary production at the base of the food chain by algae</li> </ul>
<u>Community Productivity</u>	<ul style="list-style-type: none"> <li>Manage <b>trophic level removals</b> taking into account consumption requirements of higher trophic levels</li> <li>Manage <b>total removals</b> taking into account system production capacity</li> </ul>
<u>Population Productivity</u>	<ul style="list-style-type: none"> <li>Keep <b>fishing mortality</b> moderate</li> <li>Allow sufficient <b>spawning biomass</b> to escape exploitation</li> <li>Promote positive <b>biomass change</b> when biomass is low</li> <li>Target % <b>size/age/sex</b> of capture to avoid wastage</li> <li>Limit disturbing <b>activity in spawning areas/seasons</b></li> <li>Manage <b>discarded catch</b> for all harvested species</li> </ul>
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<u>Population Di-</u>	<b>ality in relation to component biomass</b>
<b>Habitat</b>	<ul style="list-style-type: none"> <li><i>at types</i></li> <li><b>is and waste</b> introduced in habitat</li> </ul>

build on  
existing plans

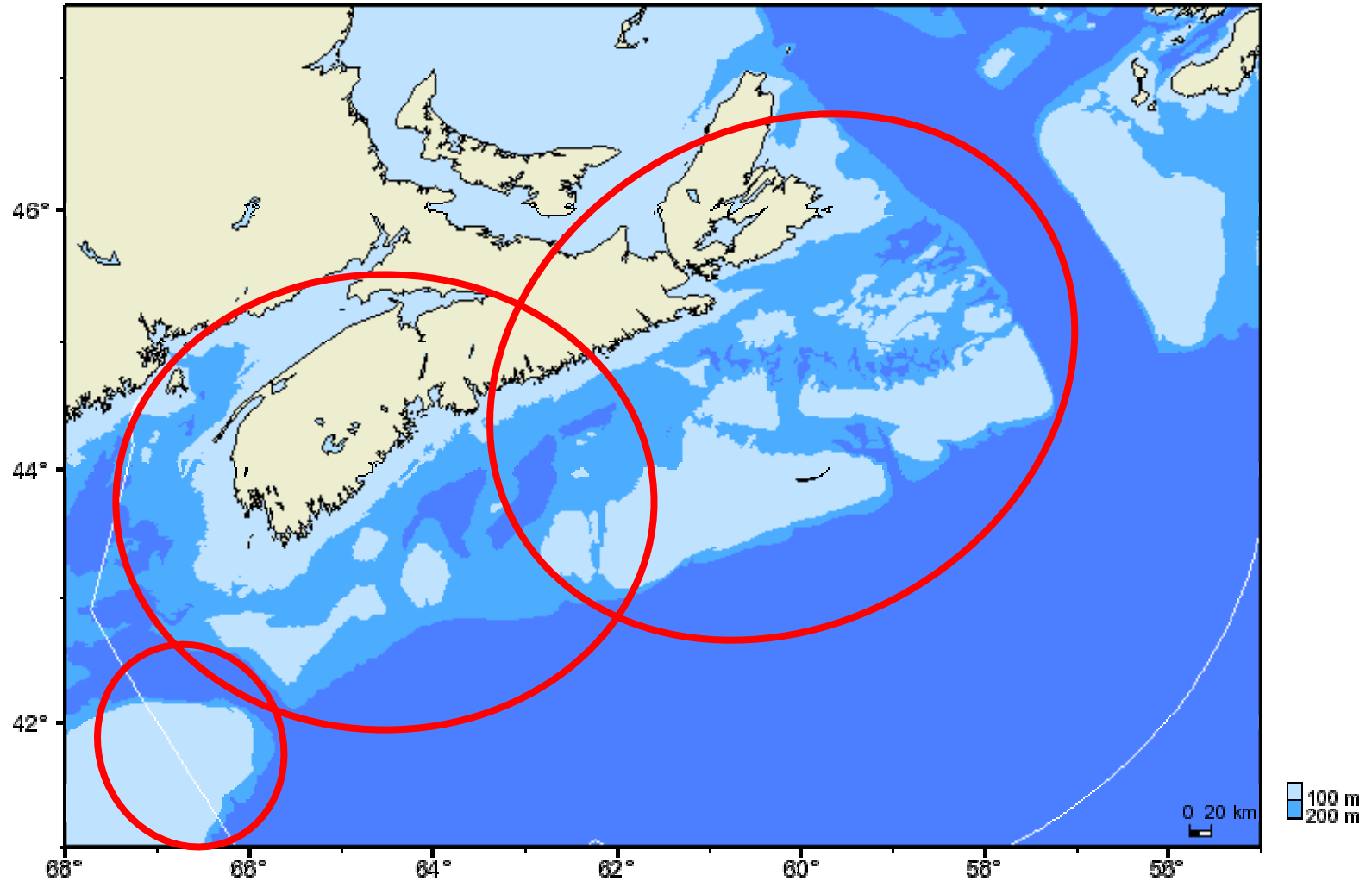
performance  
indicator

embrace emerging  
ecosystem concerns  
& include traditional  
fisheries considerations

Strategy



# Managed Area



# Productivity

## Population

- Keep fishing mortality moderate
- Allow sufficient spawning biomass to escape exploitation
- Promote positive biomass change when biomass is low
- Target % size/age/sex of capture to avoid wastage
- Limit disturbing activity in spawning areas/seasons
- Manage discarded catch for all harvested species

# Productivity

## Primary

- **Control** alteration of **nutrients concentrations** affecting primary production at the base of the food chain by algae

## Community

- **Manage** **trophic level removals** taking into account consumption requirements of higher trophic levels
- **Manage** **total removals** taking into account system production capacity

# Biodiversity

## Species

- Control incidental mortality for all non-harvested species
- Minimize change in distribution of invasive species

## Population

- Distribute population component mortality in relation to component biomass

# Habitat

- Manage area disturbed of bottom habitat types
- Limit amounts of contaminants, toxins and waste introduced in habitat
- Minimize amount of lost of gear
- Control noise or light level/frequency

# What Needs to be Done

- Important Impacts

- Removals from commercial harvest



- Control exploitation

- Discards and incidental mortality



- Manage unintended catch

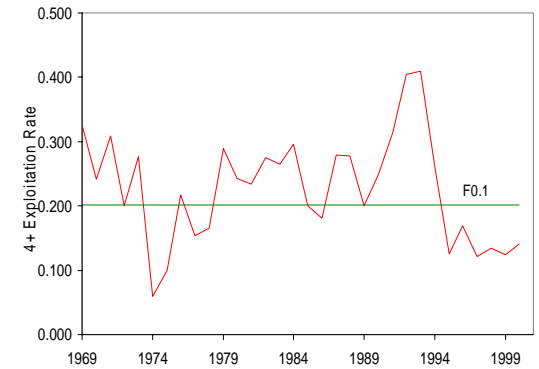
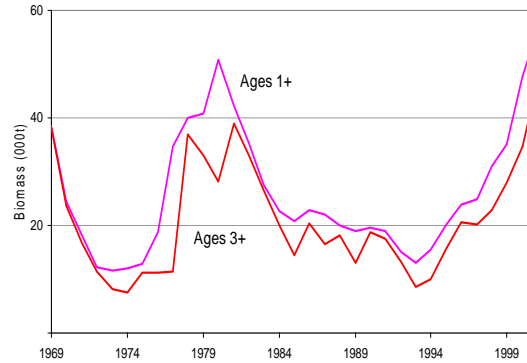
- Disturbance of benthic habitat



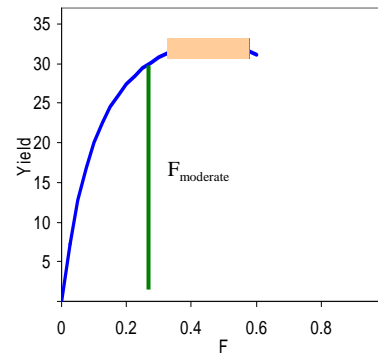
- Limit %area disturbed

# Controlling Exploitation

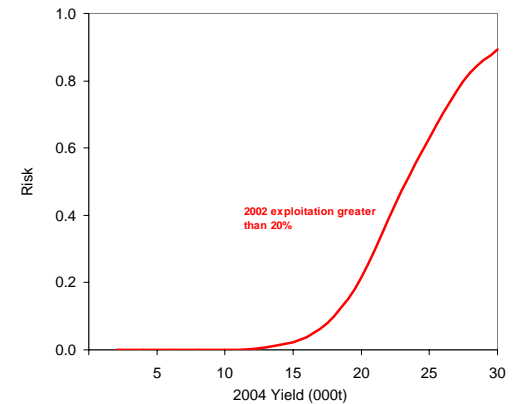
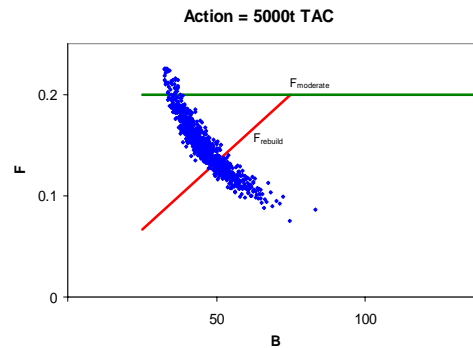
stock status



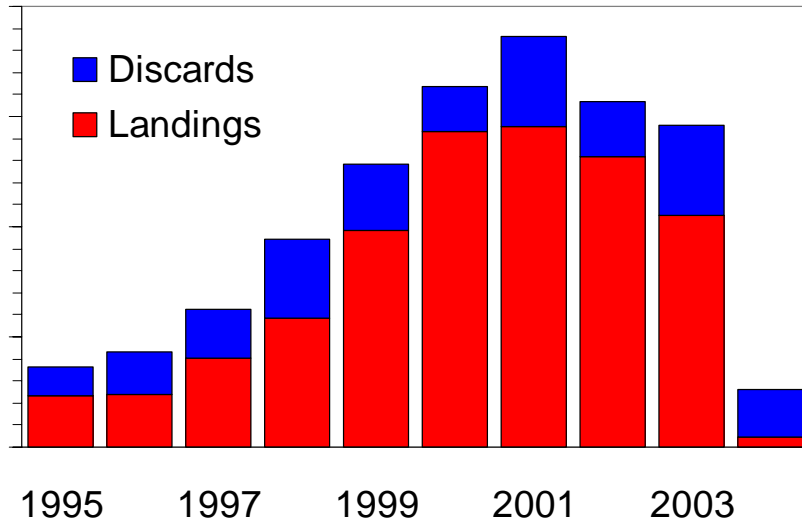
harvest strategy



risk management

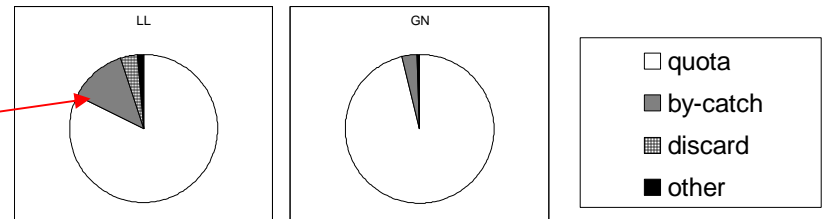


# Discards & Incidental Mortality

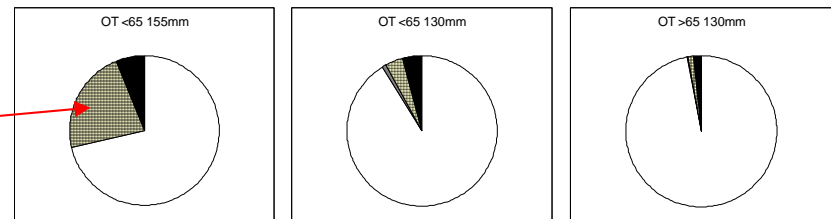


Discards of yellowtail flounder in scallop fishery

Catches of cusk and catfish in longline fishery



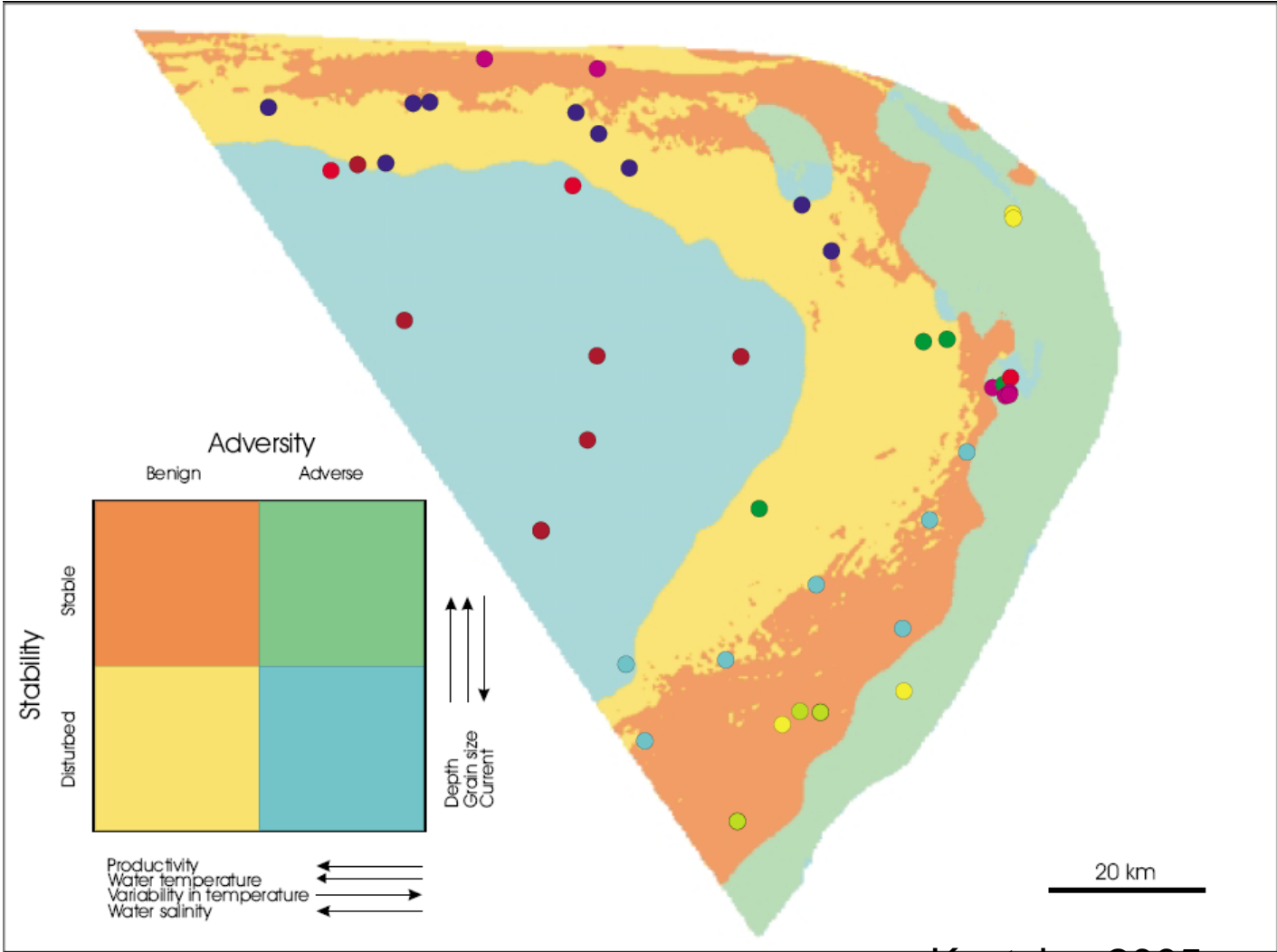
Discards of skates in dragger fishery



# Disturbance to Habitat

- classification of habitat (zones?)
- an understanding of the impacts by fishing on the various habitats (severity?)
- quantification of the bottom area affected by the fishing activities (frequency/area?)

# Habitat Classification



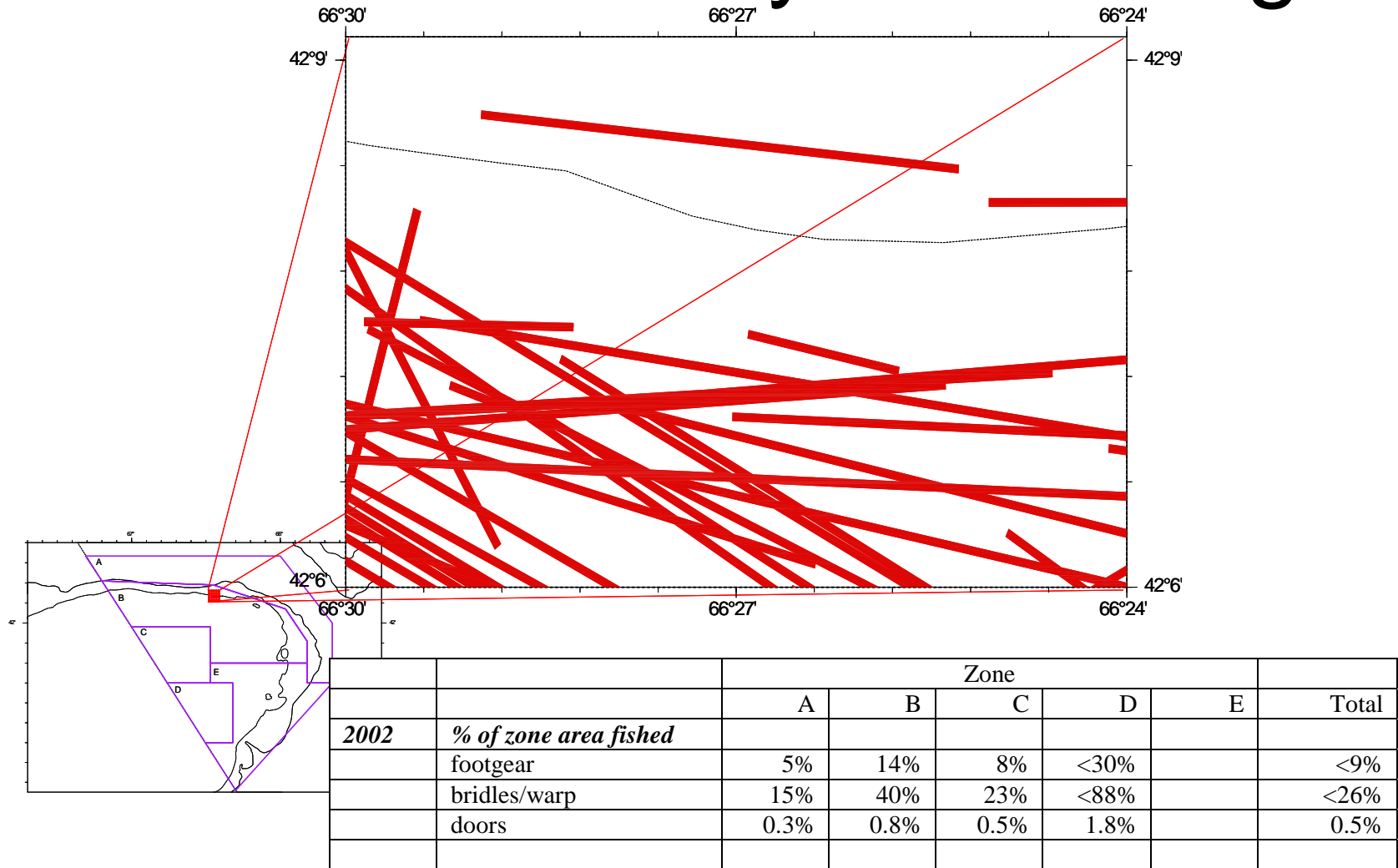
Kostylev 2005

HOW CAN IT BE DONE?

# Plan Evaluation

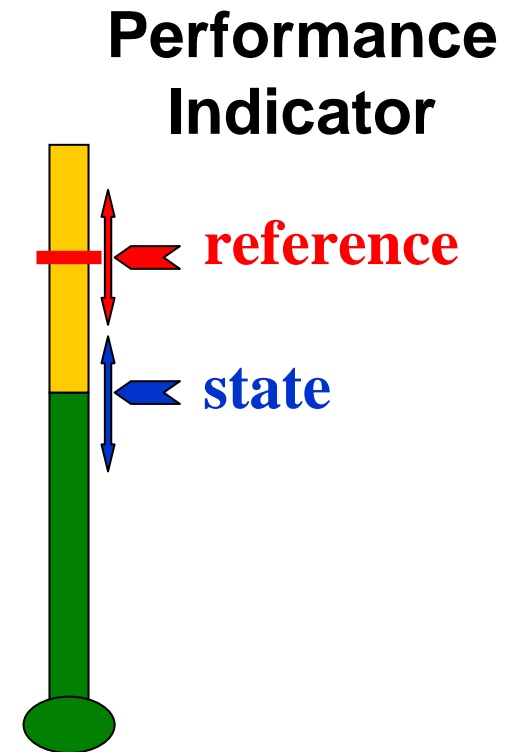
	Strategies ( <u>performance indicator</u> )	Managed Activity			
		GF	HF	SF	L/CF
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# Enhanced Fishery Monitoring



# Indicators

- Performance indicator
  - Pertinent to strategy
  - Measure response to managed activity
- Reference points are guideposts



# Next Steps

- Revise fisheries management plans to address EBM strategies
- Enhance fishery monitoring to capture information pertinent to EBM strategies
- Establish indicator reference points