



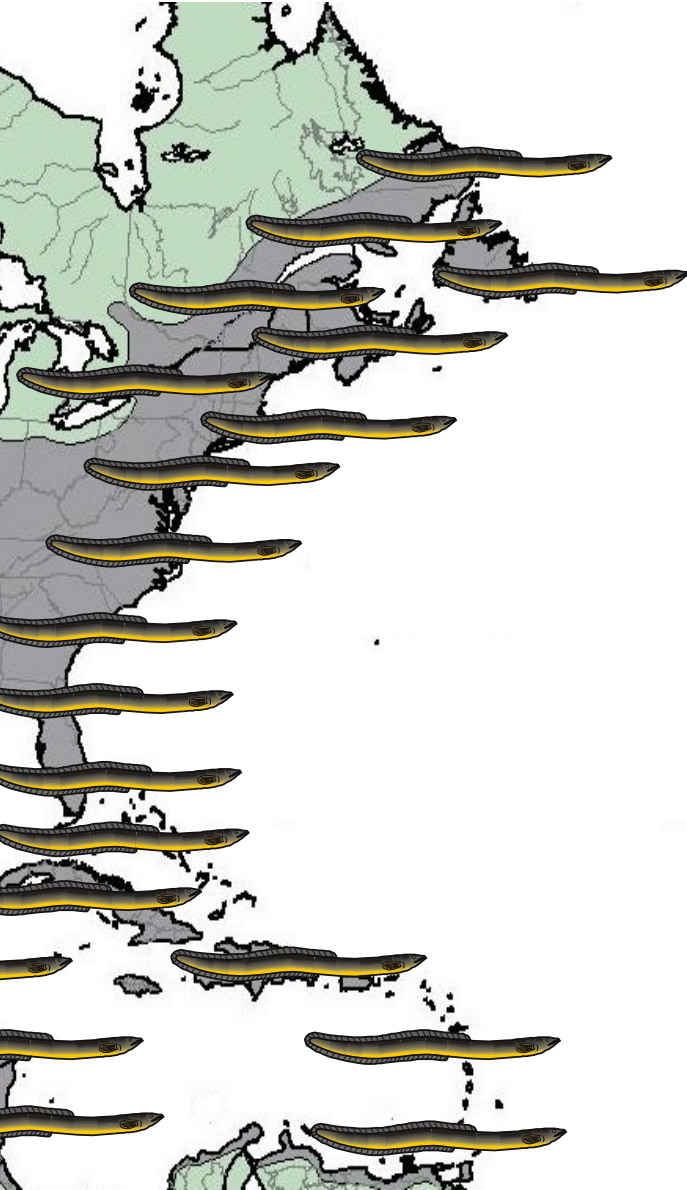
# **Distribution, biology, and conservation of American eels in Canada**

**David Cairns**

**Department of Fisheries and Oceans**

**American Eel Symposium: Future Directions for Science, Law and Policy  
Portland, Maine, 23 - 25 October 2015**

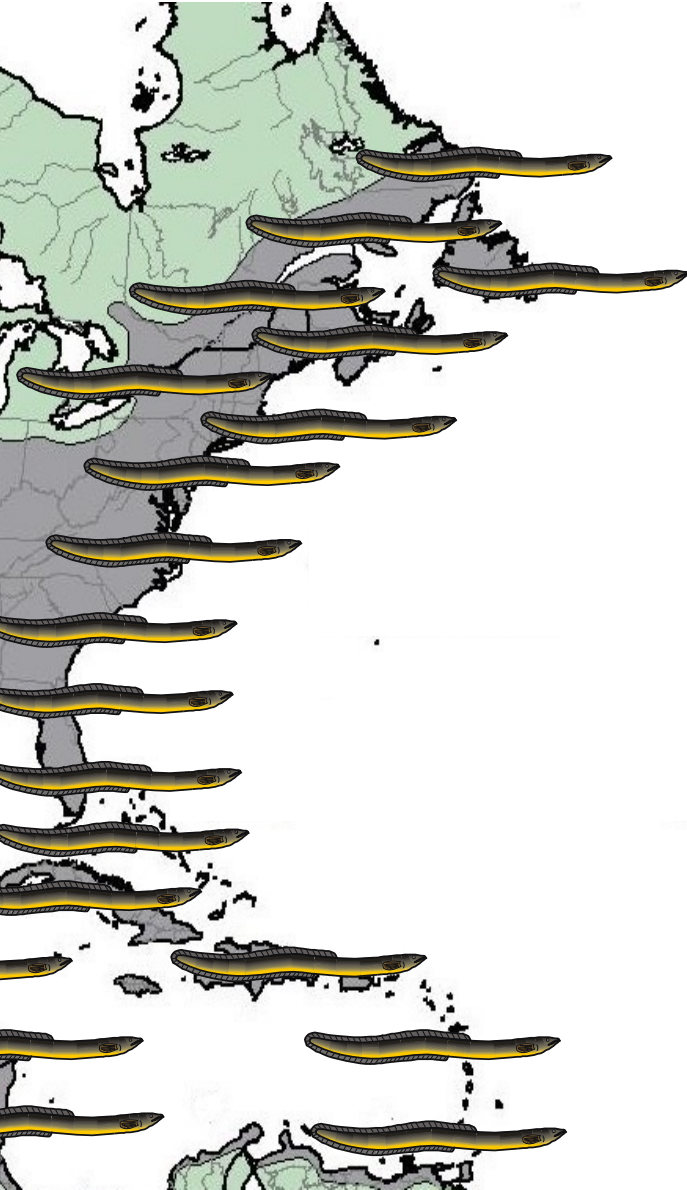
# Panmixia and stocks



**The entire species  
forms one breeding unit**

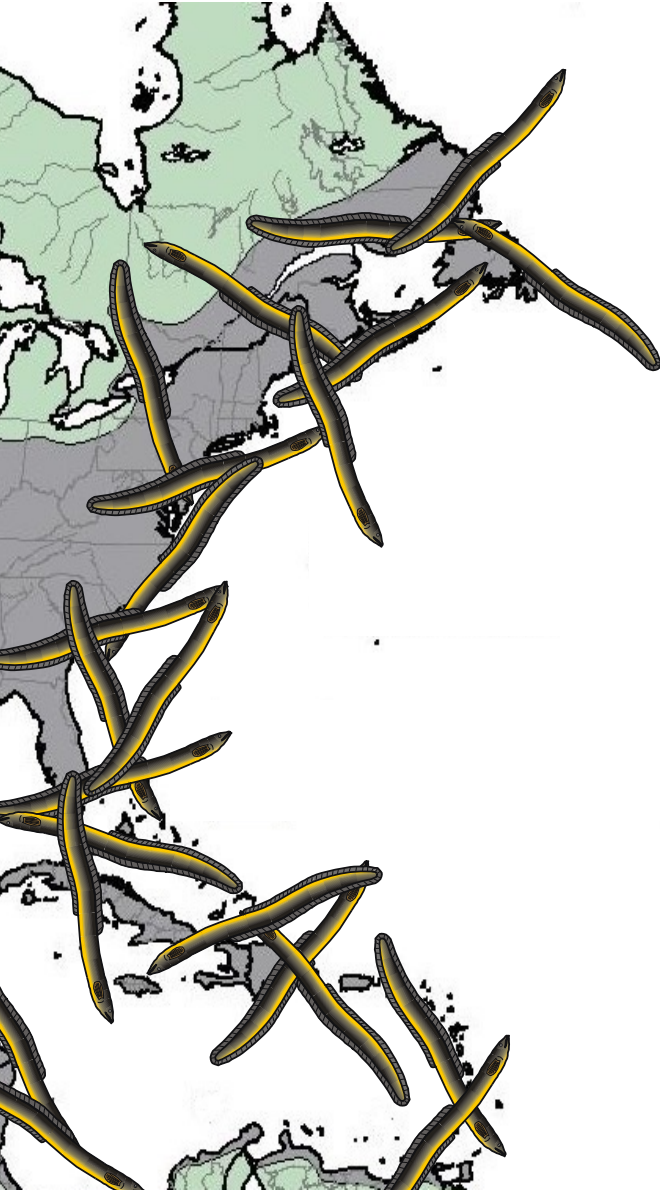
**Therefore the entire  
species forms one stock**

# Panmixia



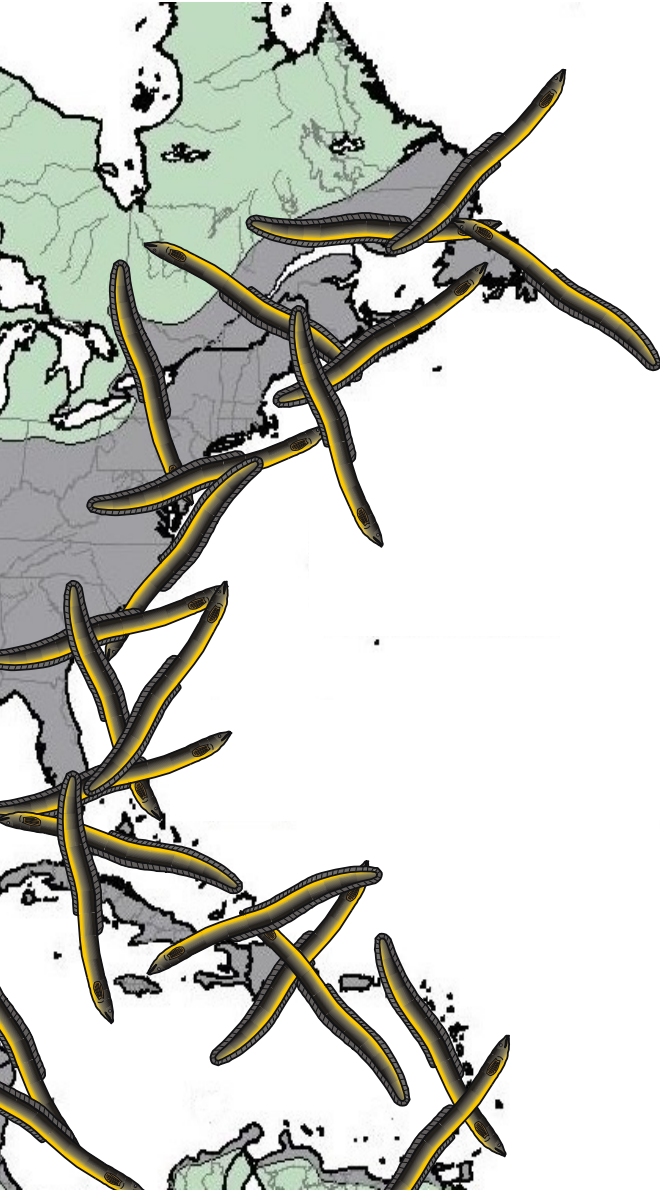
So we expect coherence  
in behaviour, life history,  
and population trends  
across the range.

# The Panmixia Paradox



... but major ecological characteristics often vary sharply, even over short distances.

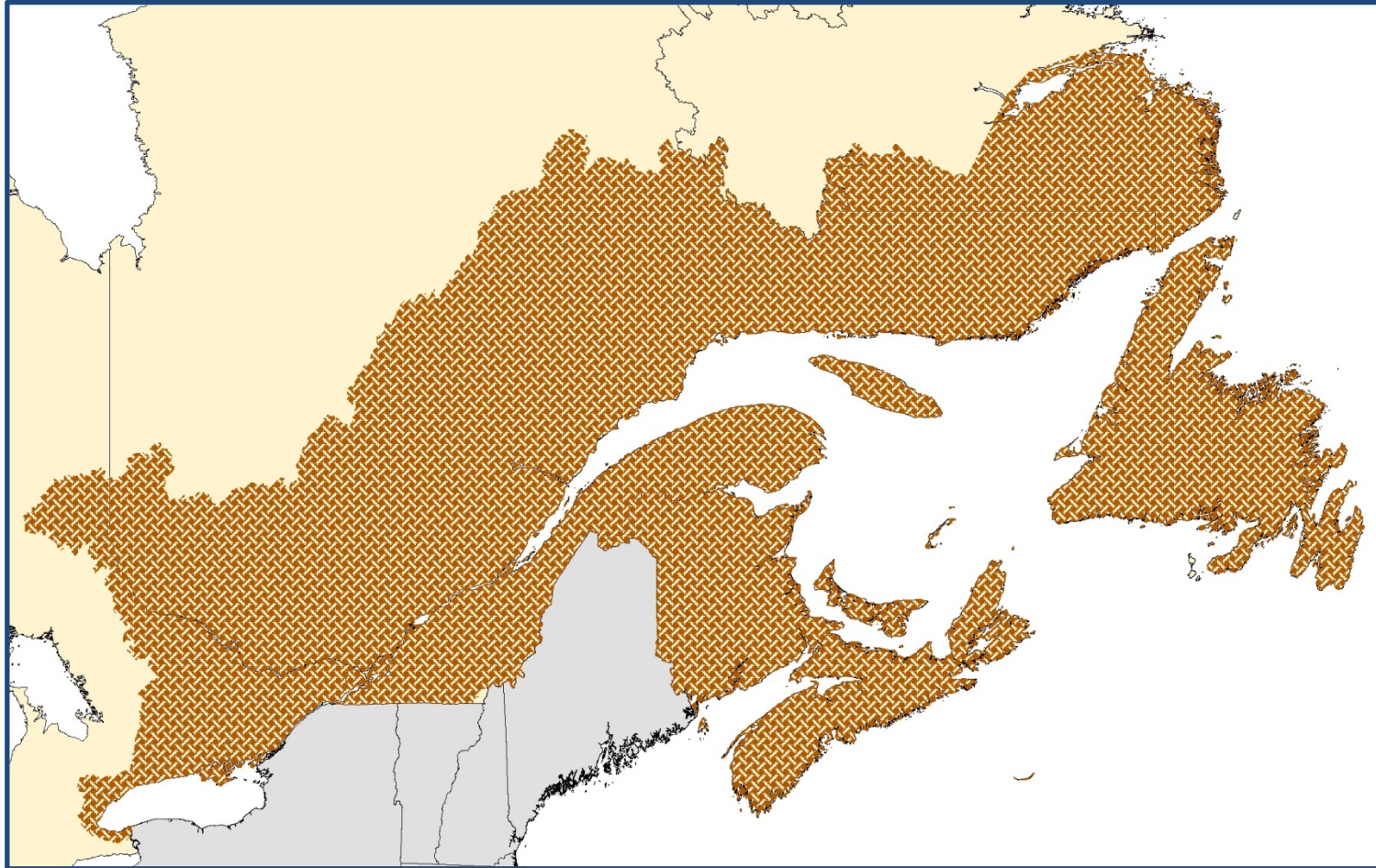
# The Panmixia Paradox



American eels are a true biological stock, but they often don't behave like one.

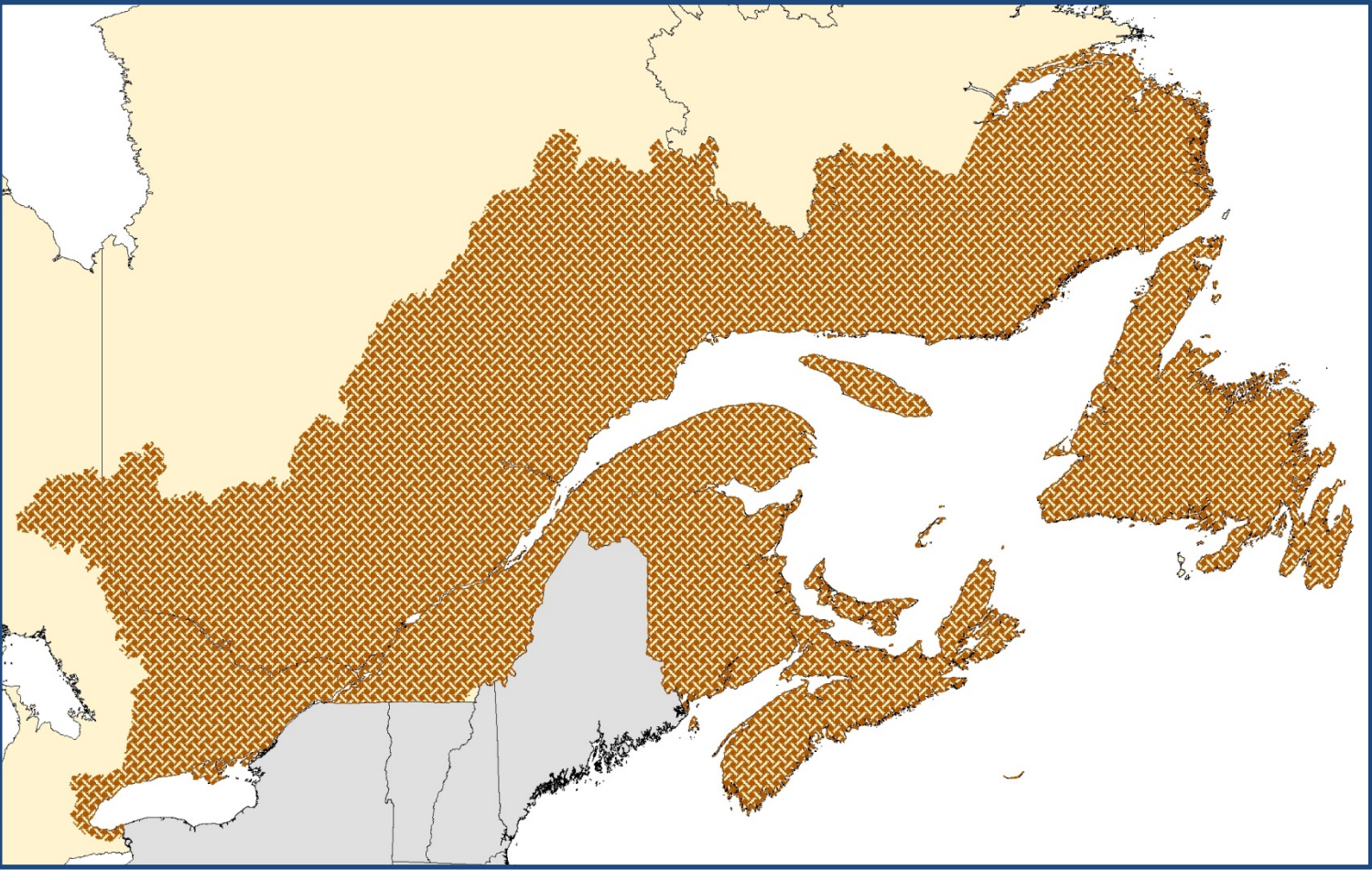
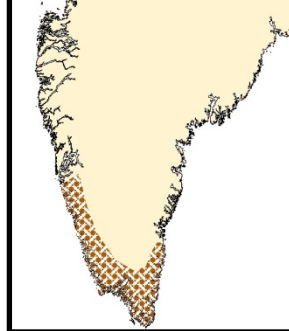


# Eel range in Canada





# Range in Greenland







# Range includes both . . .

## Saline waters



## Fresh waters



9,000 km<sup>2</sup>

?





# Range includes both . . .

## Saline waters



## Fresh waters



9,000 km<sup>2</sup>



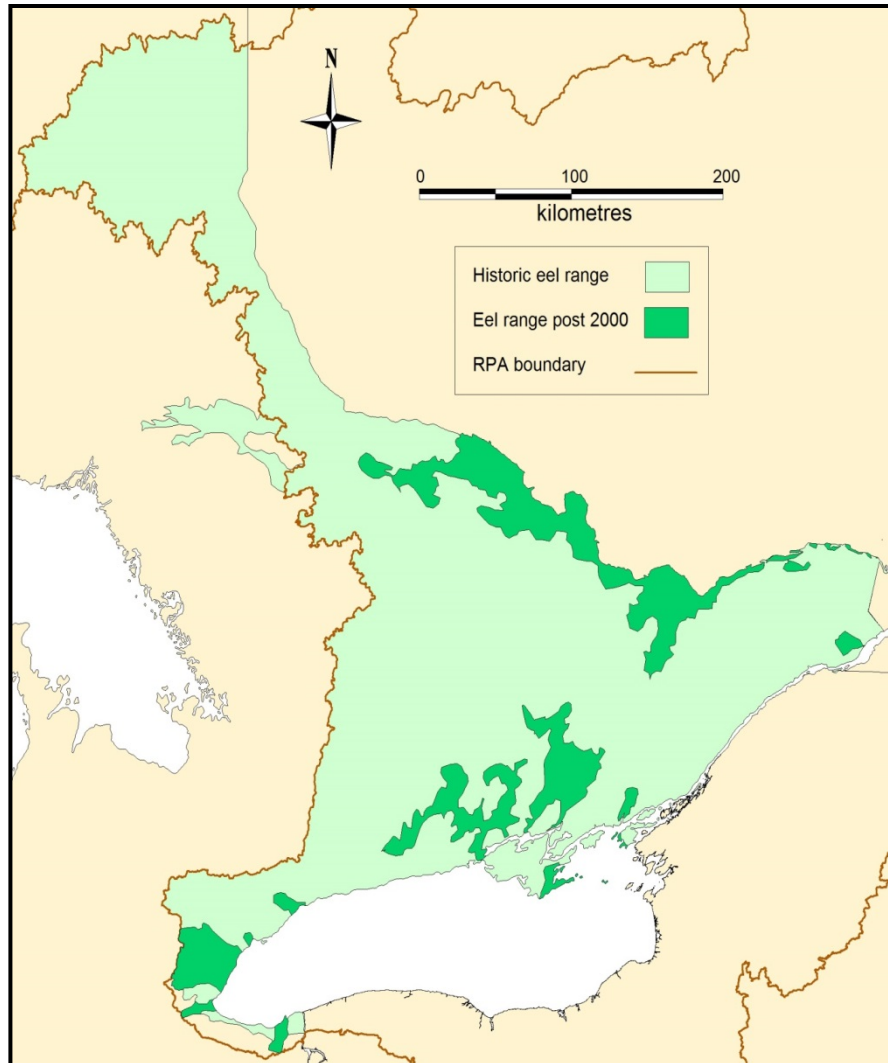
14,000 km<sup>2</sup>

(East coast)

?

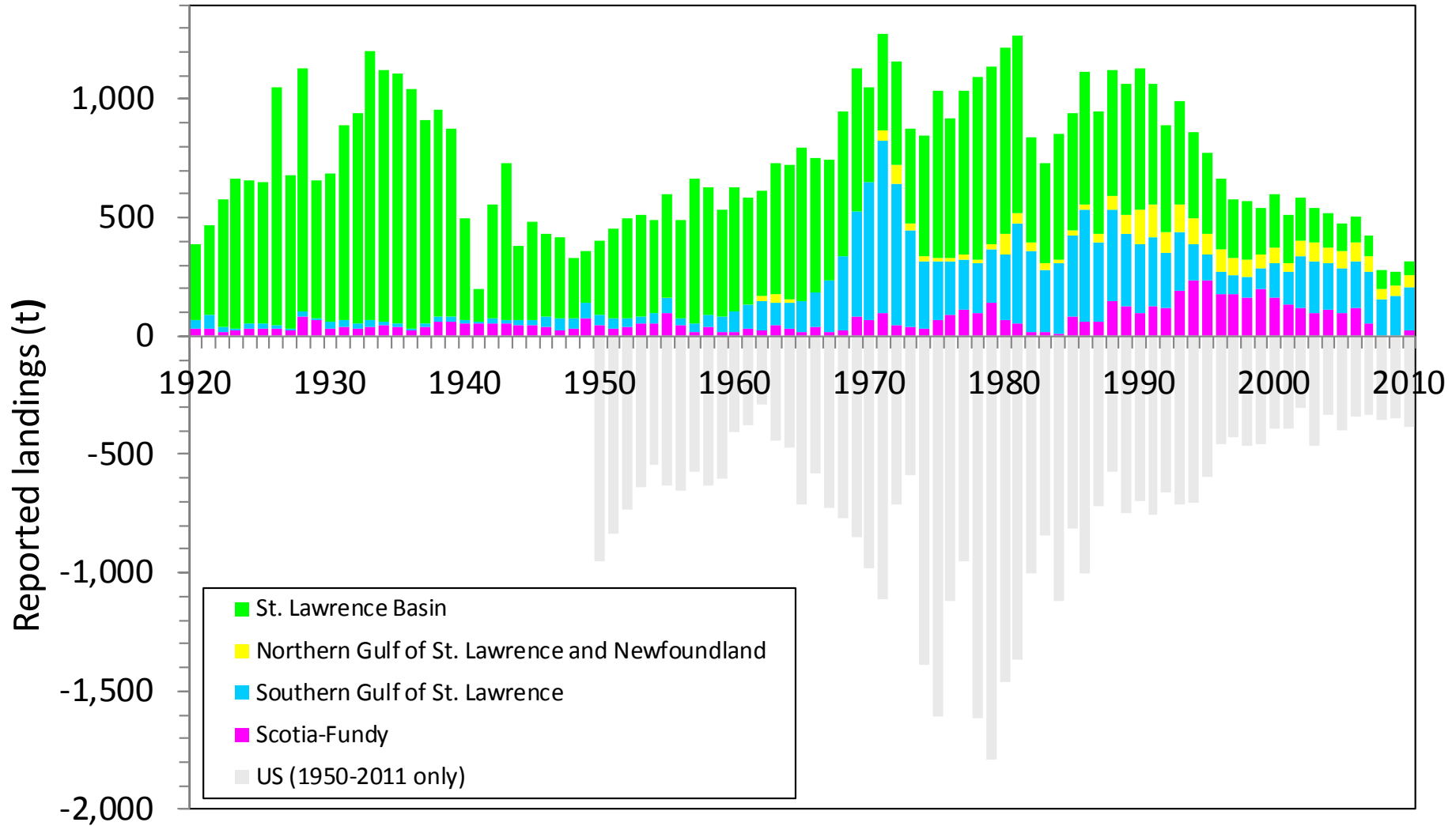
18,000 km<sup>2</sup>

But we know that range has diminished in fresh water, especially in areas distant from the sea

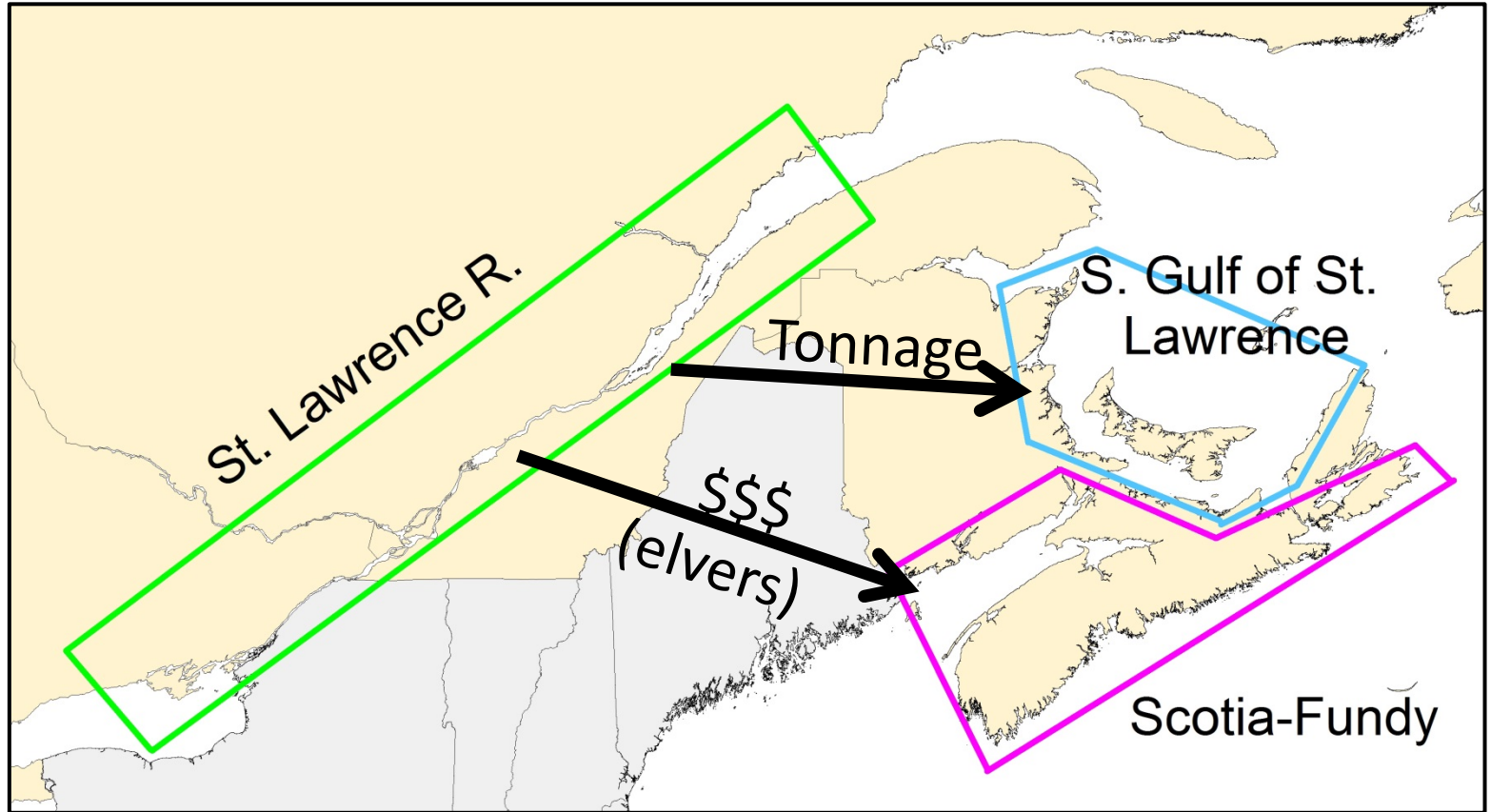
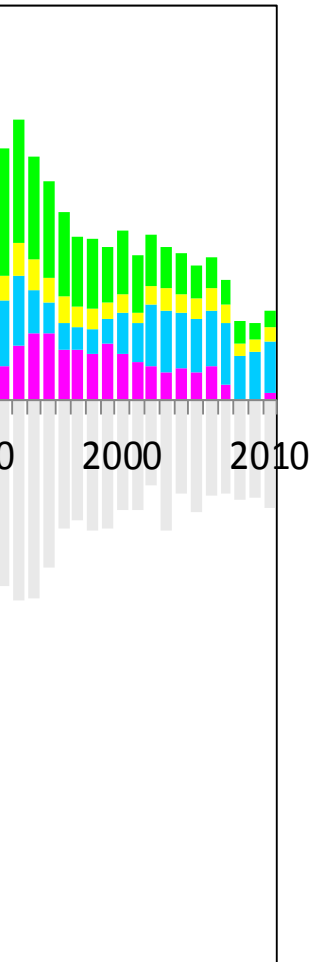


Data from MacGregor et al. 2010

# Eel landings

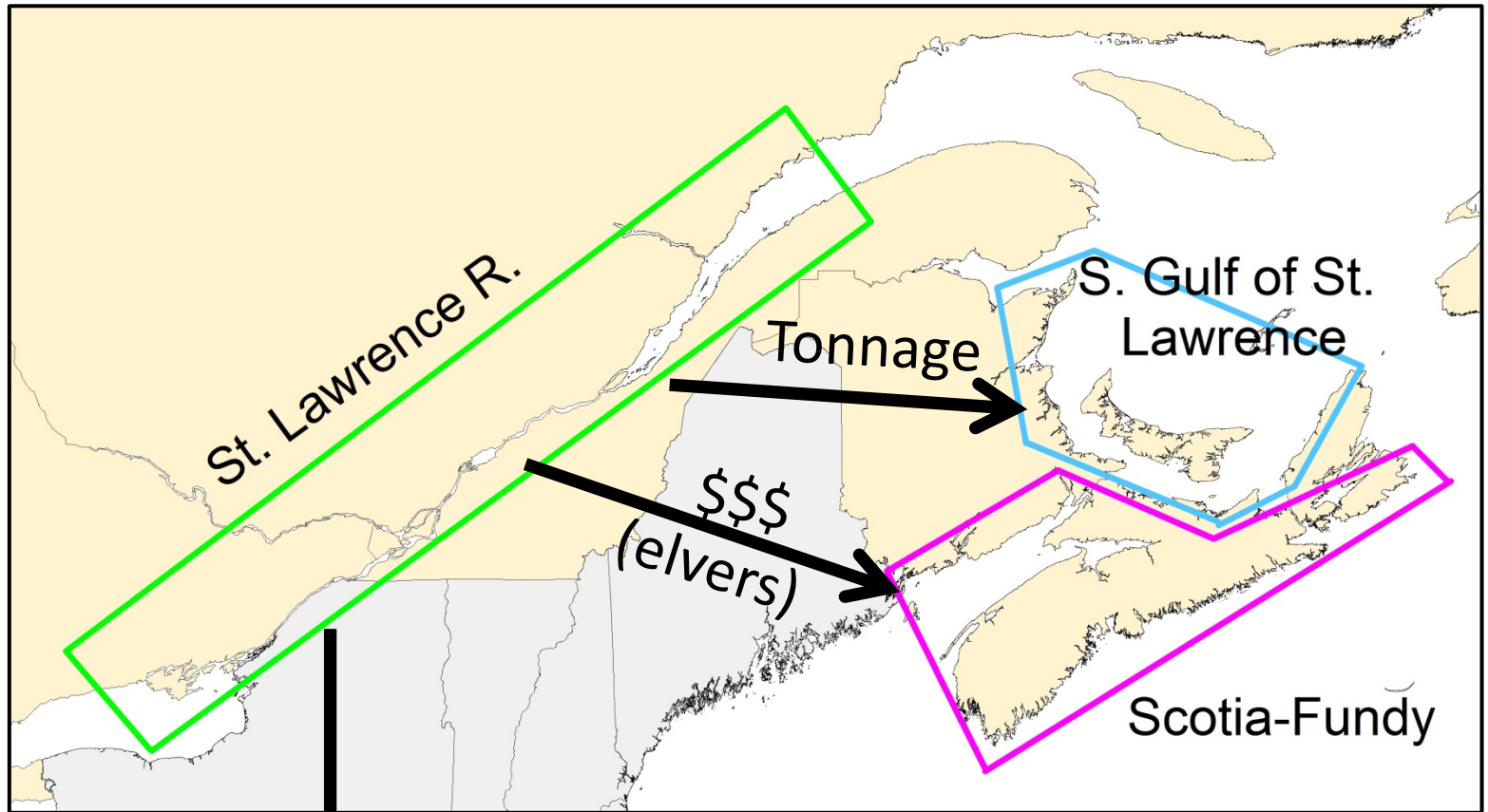
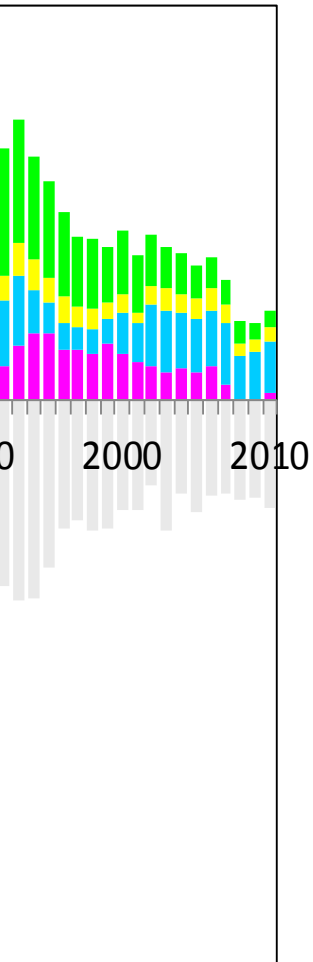


# Shifts in the landscape



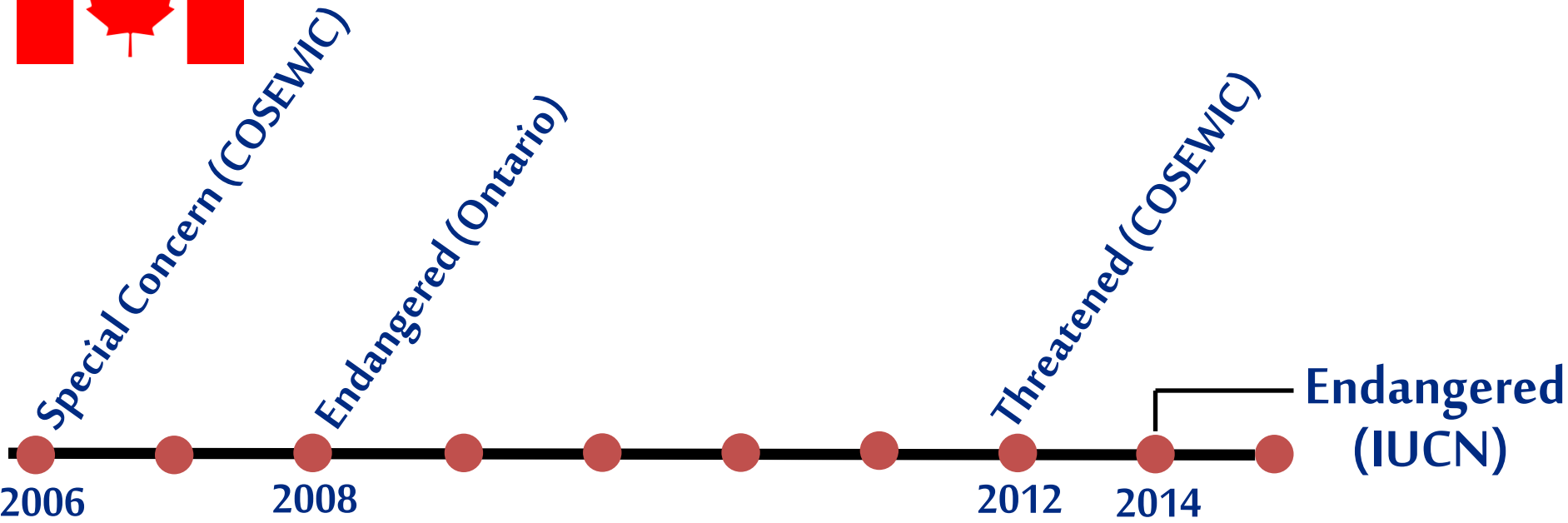


# Shifts in the landscape

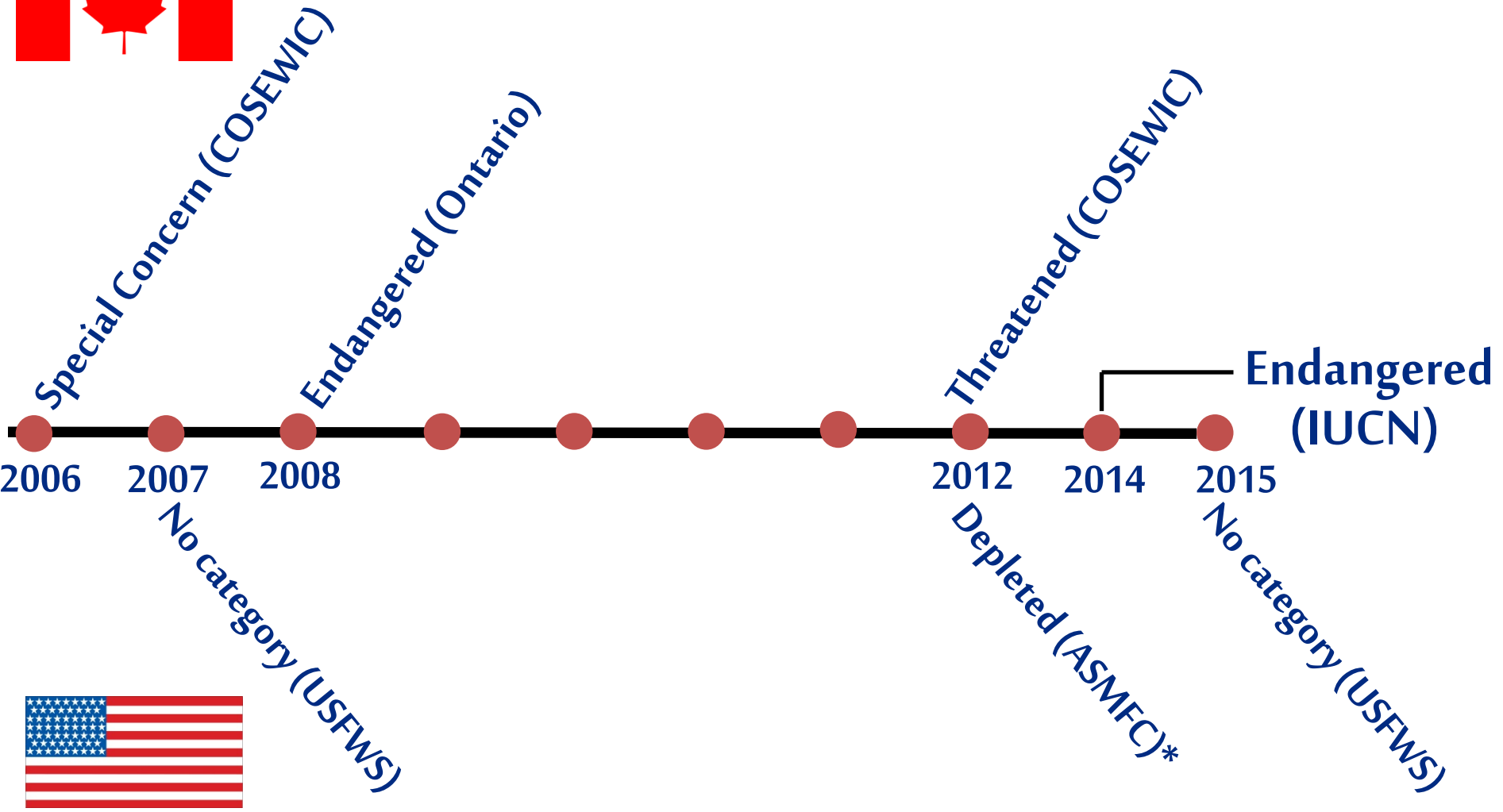


**Main focus of  
conservation  
concern**

# Status



# Status



\*Unclear if Depleted refers to all US eels, or only those subject to exploitation



# Status

In Canada, there is a distinction between assessment by COSEWIC and official listing under the Species at Risk Act.

Most common outcomes of COSEWIC assessments:

- Delays of several years before a listing decision
- COSEWIC recommendation not accepted

COSEWIC first assessed eels in 2006. A decision still awaits.

Missing the safety net: evidence for inconsistent and insufficient management of at-risk marine fishes in Canada

Jamie Marie McDevitt-Irwin, Susanna Drake Fuller, Catharine Grant, and Julia Kathleen Baum

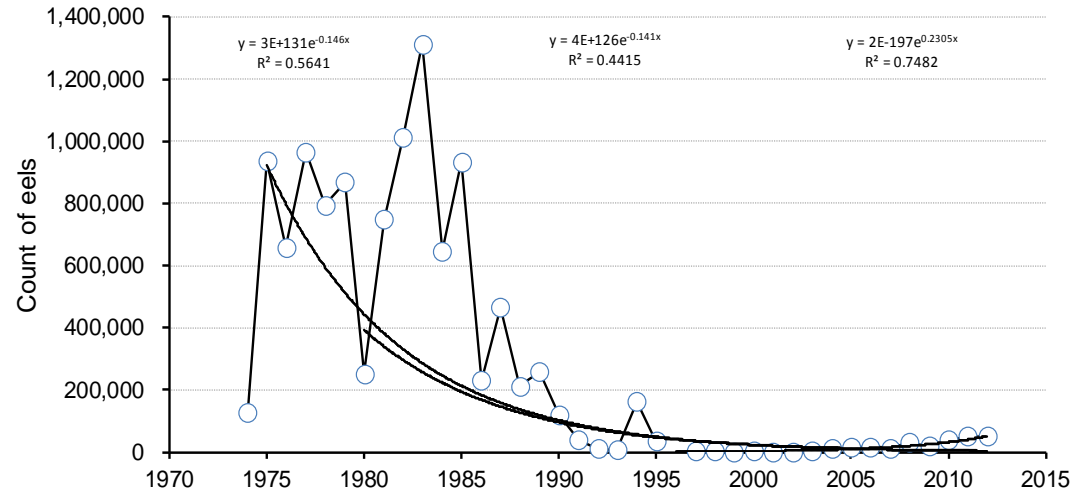
Canadian Journal of Fisheries and Aquatic Sciences 72: 1–13 (2015)



# Canadian status:

## Overall decline, but high spatial variability

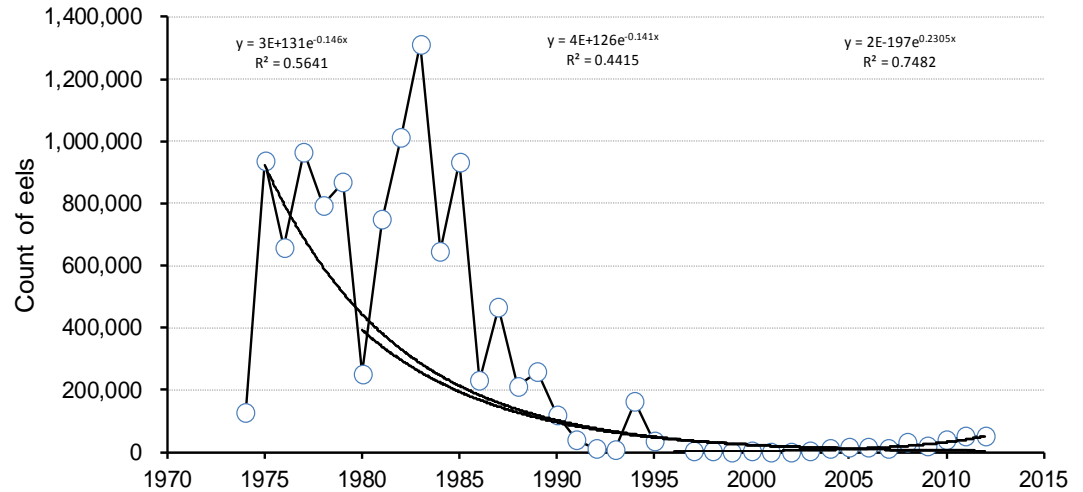
Upper St. Lawrence River:  
Precipitous decline,  
slight recent improvement



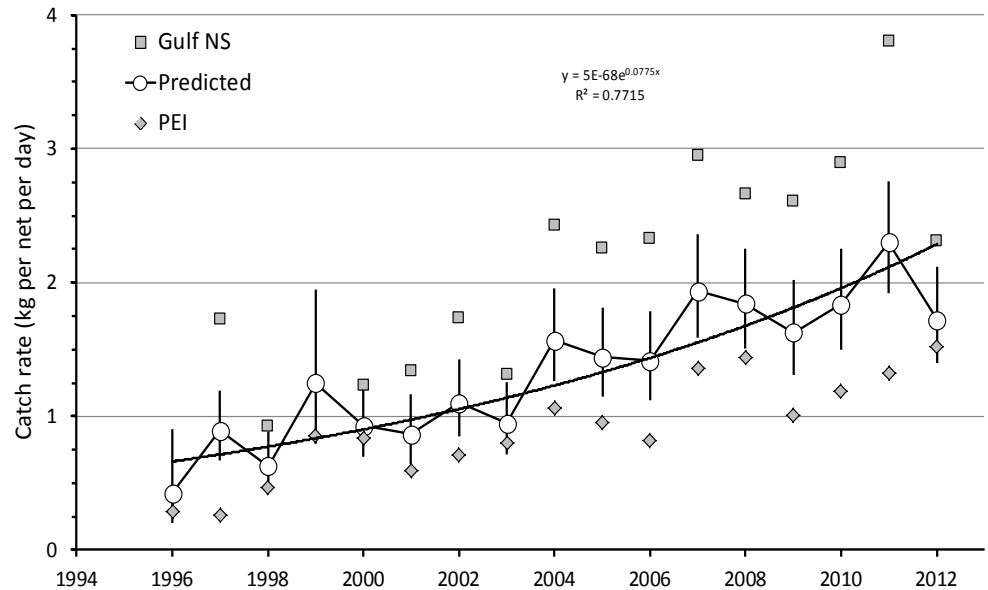
# Canadian status:

## Overall decline, but high spatial variability

Upper St. Lawrence River:  
Precipitous decline,  
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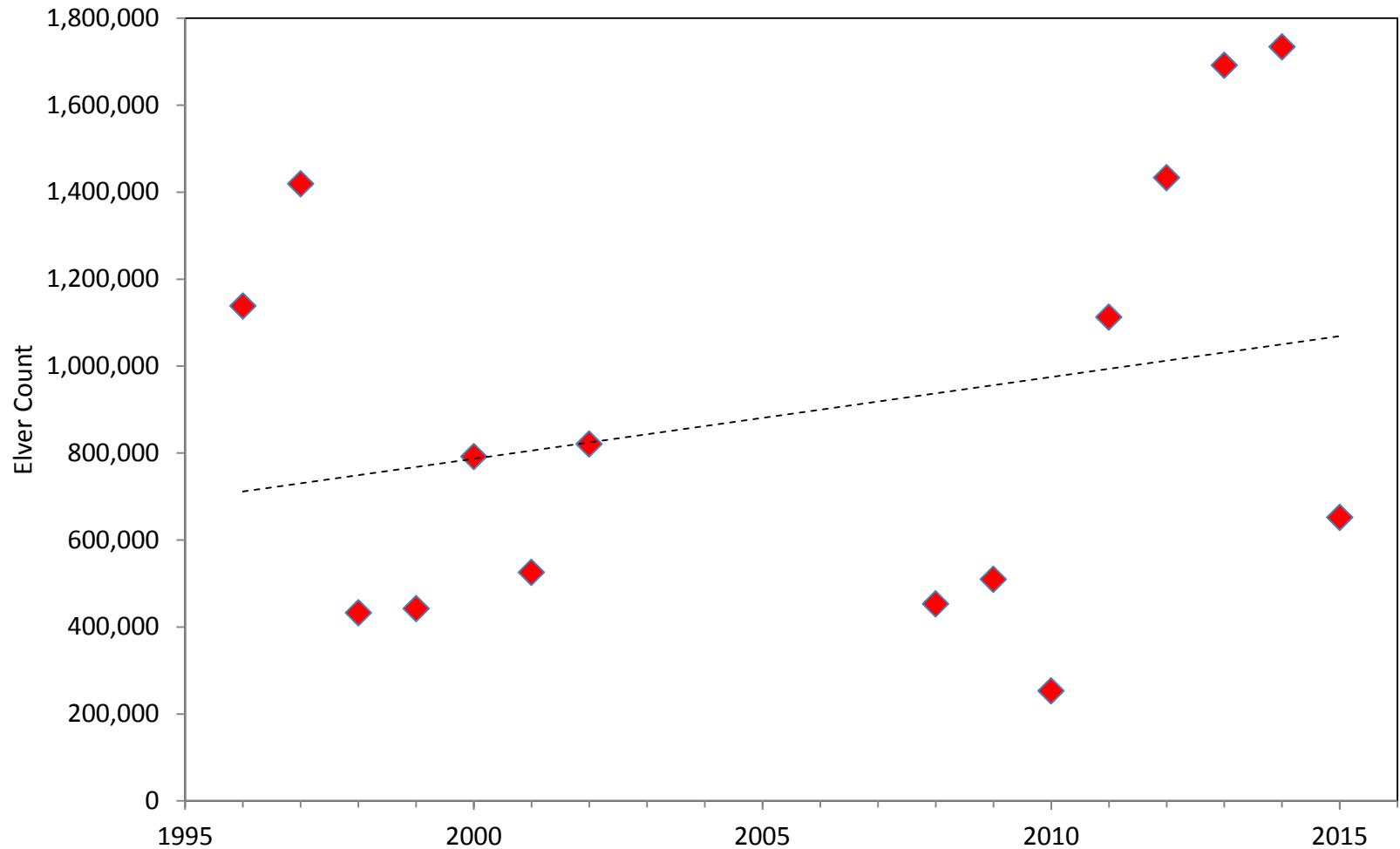


Southern Gulf of St. Lawrence:  
Increase since the mid 1990s



# Canadian status:

## Elvers ascending the East River, Chester, Nova Scotia



# Threats

## Migratory obstructions

Upstream - loss of habitat

Downstream - turbine mortality



## Habitat alteration

## Contaminants

Parasites - *Anguillicola crassus*

## Ocean changes

## Fisheries



# Threats

## Migratory obstructions

Upstream - loss of habitat

Downstream - turbine mortality



## Habitat alteration

## Contaminants

Parasites - *Anguillicola crassus*

Ocean changes

Fisheries



# Threats

## Migratory obstructions

Upstream - loss of habitat

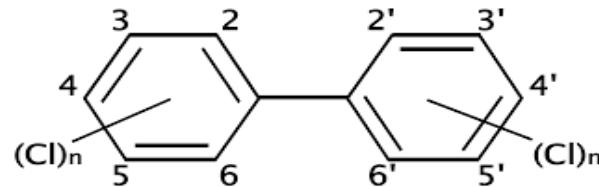
Downstream - turbine mortality



## Habitat alteration



## Contaminants



Parasites - *Anguillicola crassus*

Ocean changes

Fisheries

# Threats

## Migratory obstructions

Upstream - loss of habitat

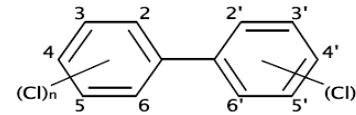
Downstream - turbine mortality



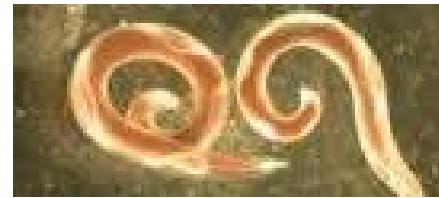
## Habitat alteration



## Contaminants



Parasites - *Anguillicola crassus*



Ocean changes

Fisheries

# Threats

## Migratory obstructions

Upstream - loss of habitat

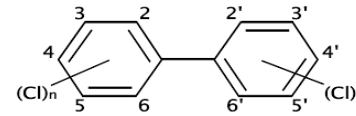
Downstream - turbine mortality



## Habitat alteration



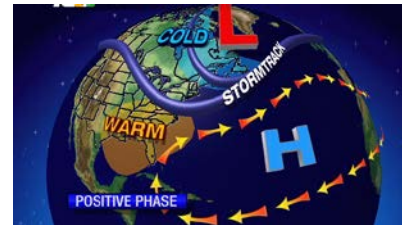
## Contaminants



## Parasites - *Anguillicola crassus*



## Ocean changes



## Fisheries

# Threats

## Migratory obstructions

Upstream - loss of habitat

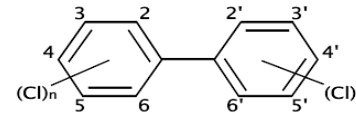
Downstream - turbine mortality



## Habitat alteration



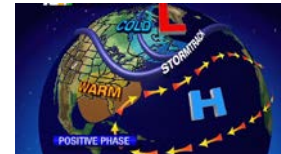
## Contaminants



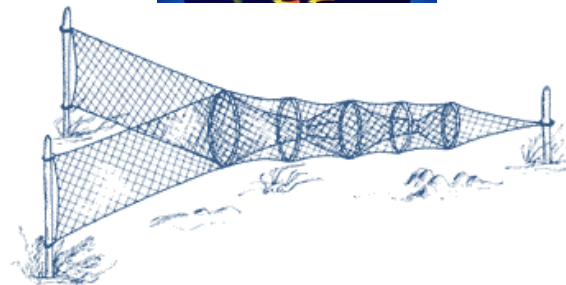
Parasites - *Anguillicola crassus*



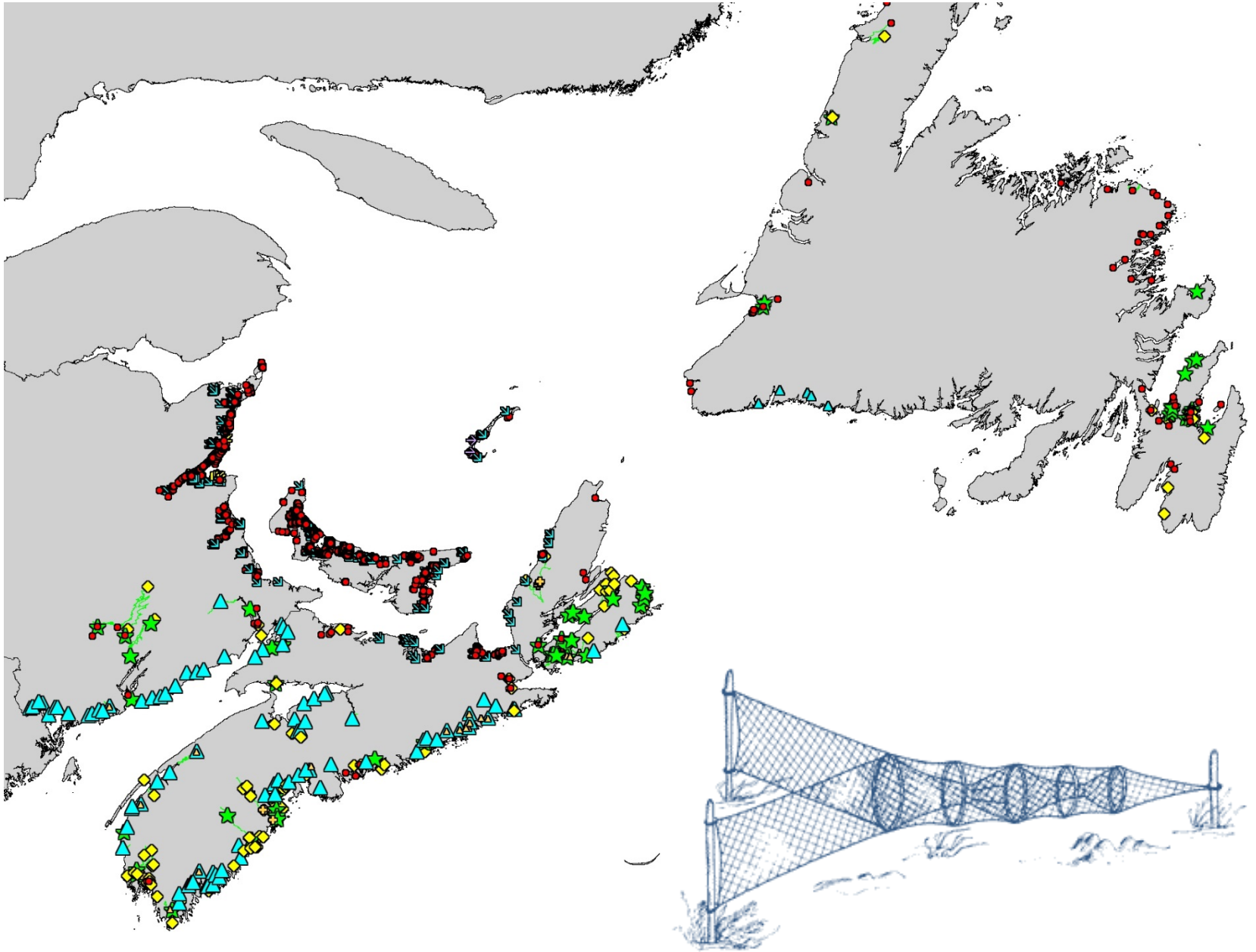
Ocean changes



Fisheries

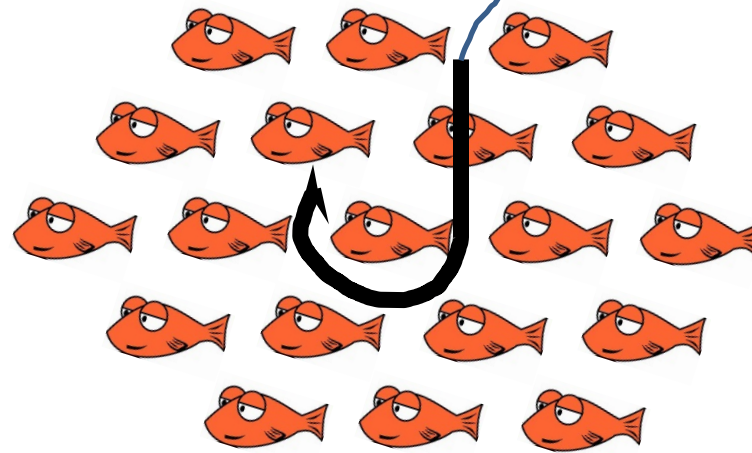


# Most eel habitat on the east coast of Canada is unfished





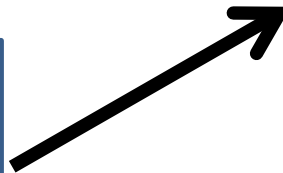
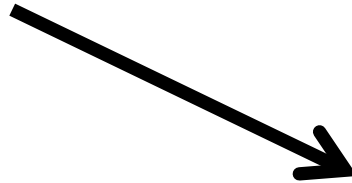
# The standard model of fisheries management



**Science  
advice**

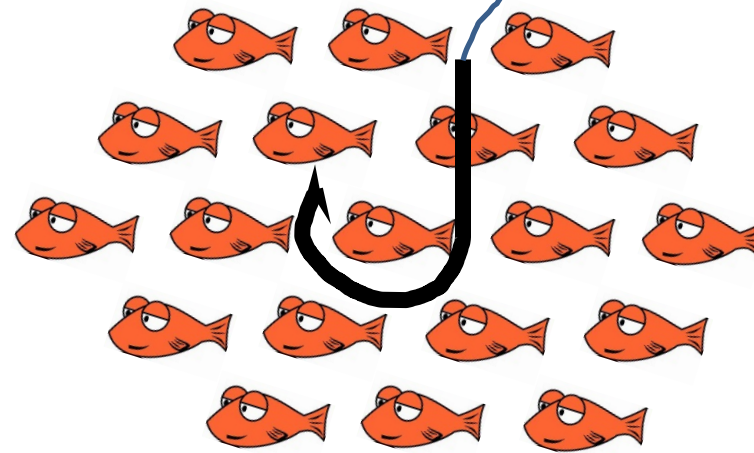
**Management  
decisions**

**Stakeholder  
input**



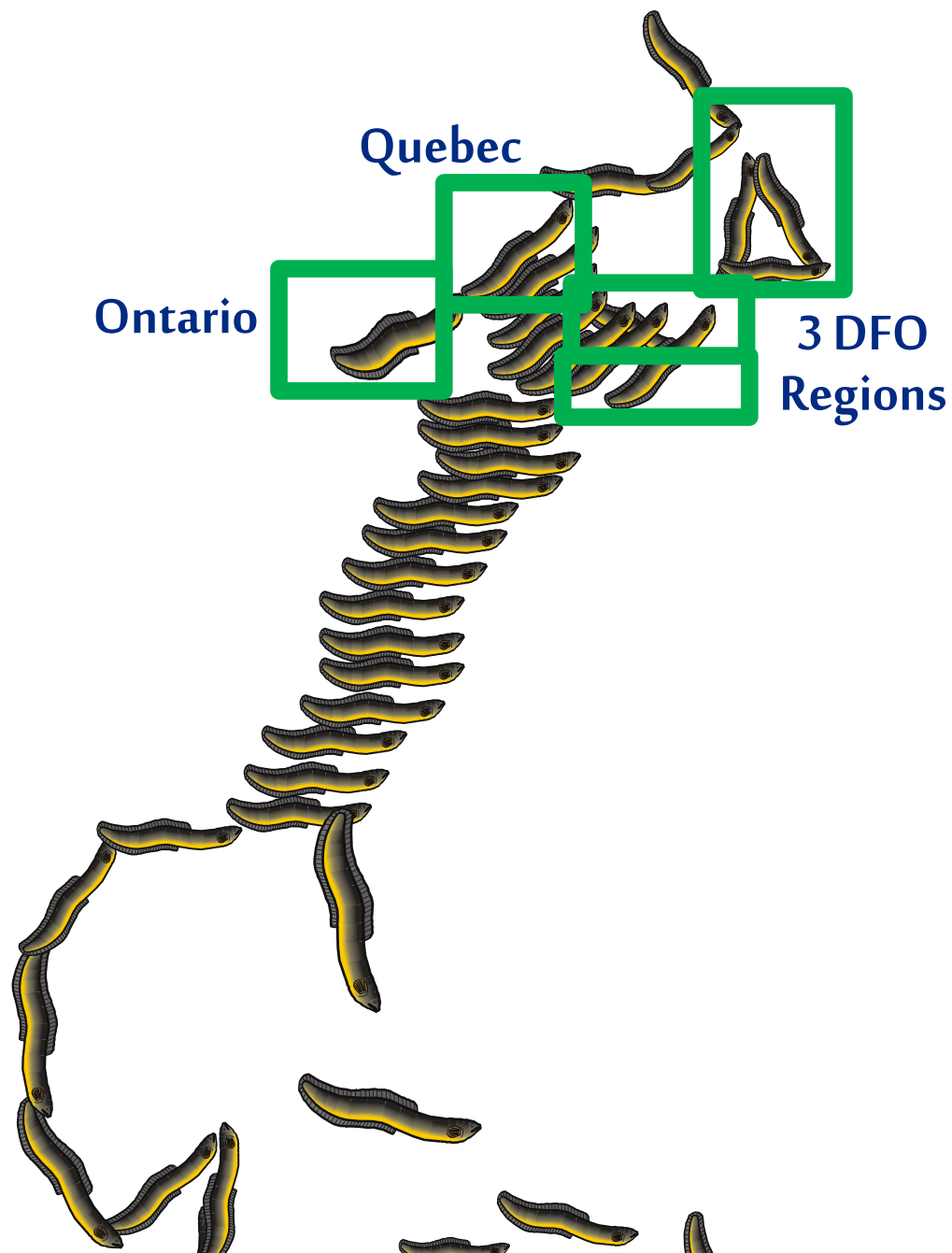


# The standard model of fisheries management



## Assumptions:

1. The fish under management constitute a stock

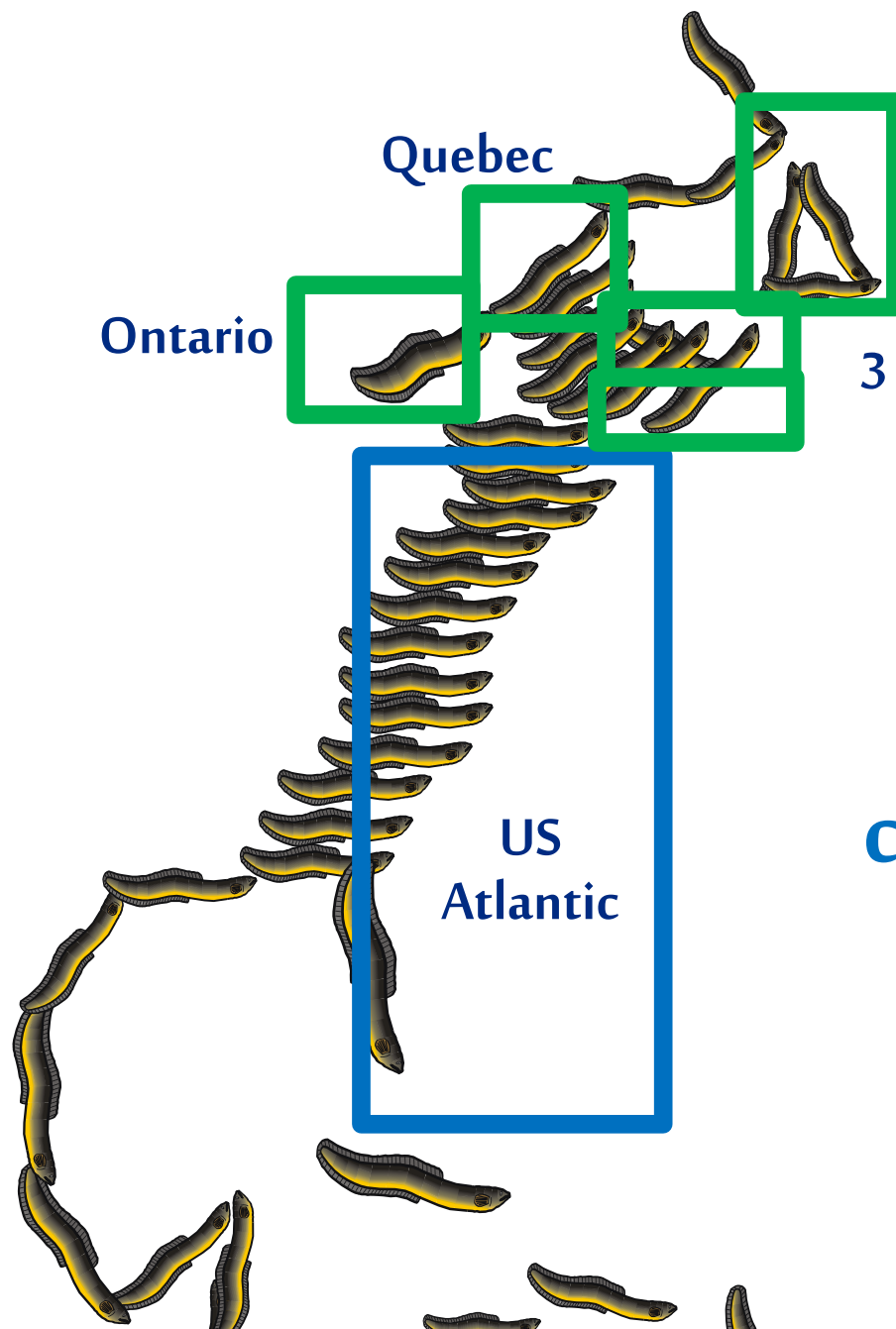


Quebec

Ontario

3 DFO  
Regions

In Canada, 5  
administrative  
units



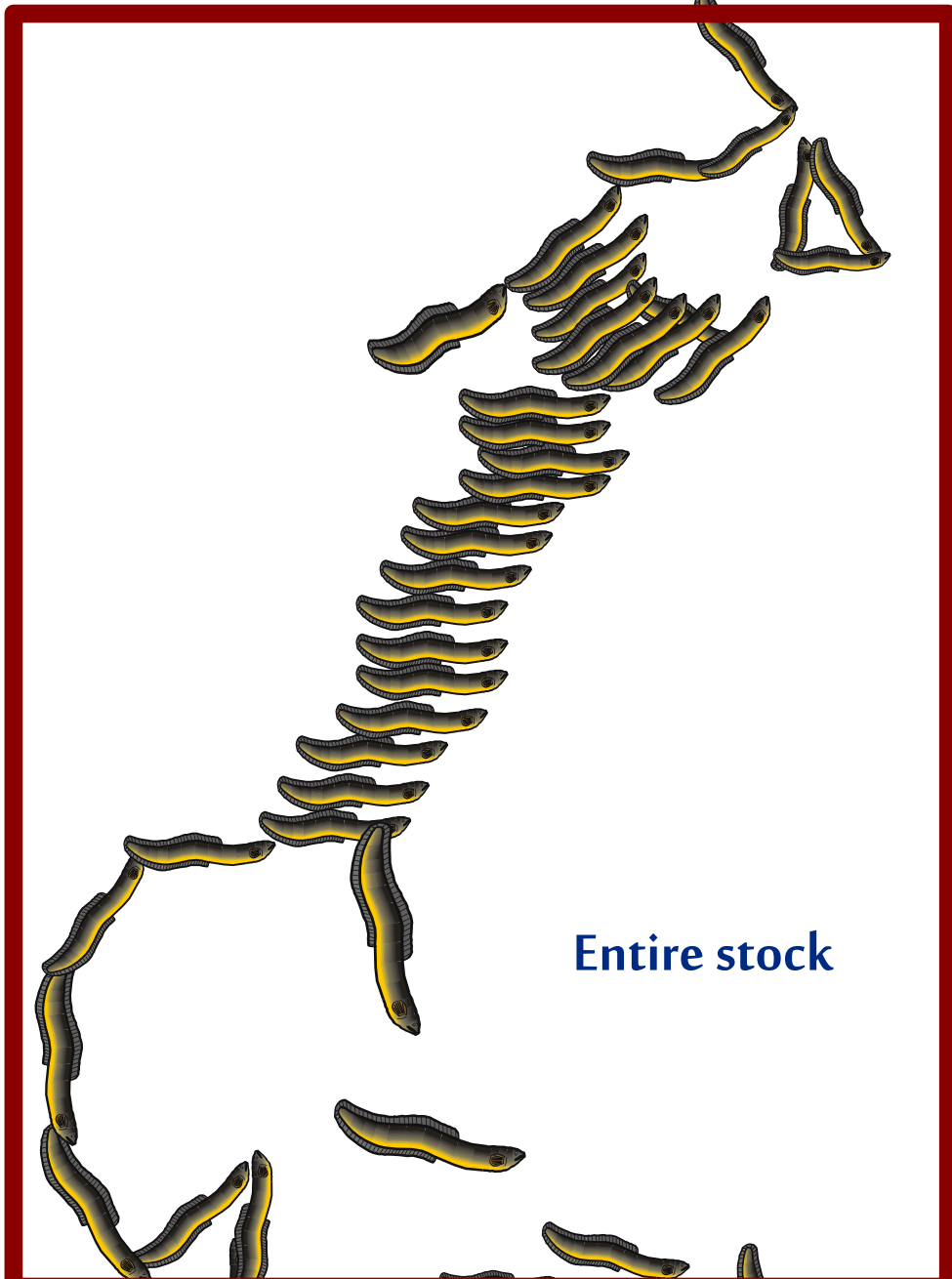
Quebec

Ontario

3 DFO Regions

US  
Atlantic

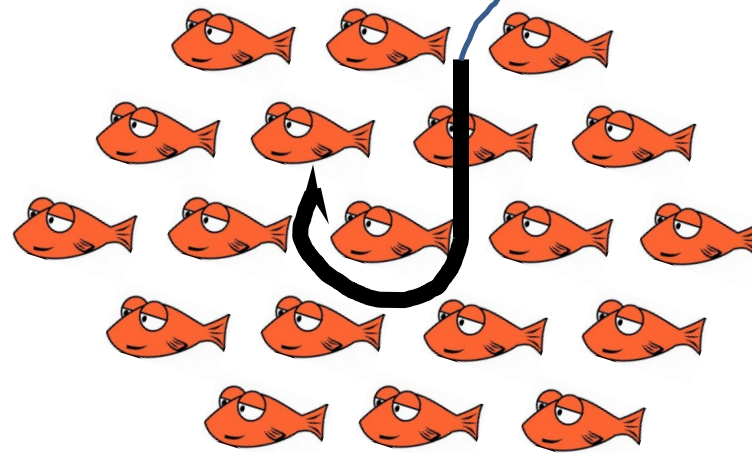
In the US,  
the ASMFC  
coordinates eel  
management



Entire stock

We need a management regime that covers the entire stock range.

# The standard model of fisheries management

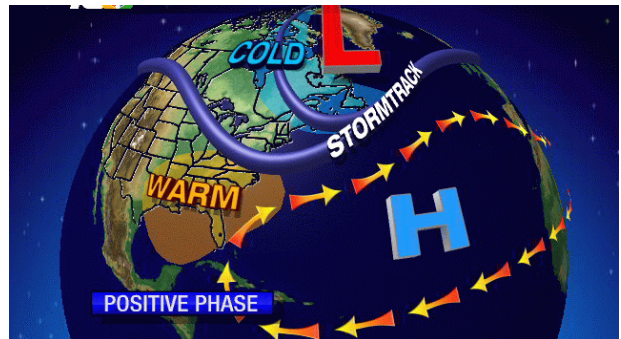
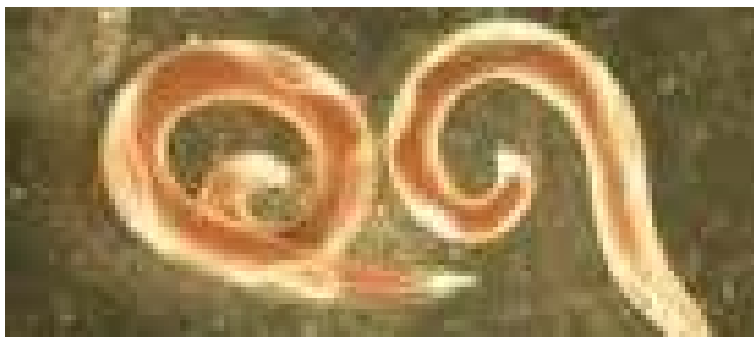
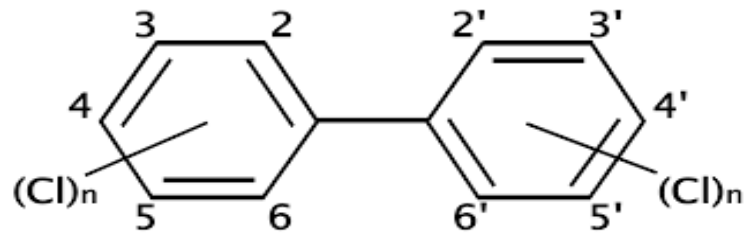
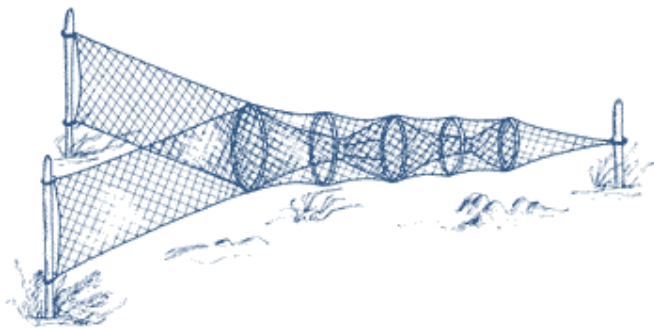


## Assumptions:

1. The fish under management constitute a stock
2. If you control fisheries, you control the main or key anthropogenic impactors on the stock



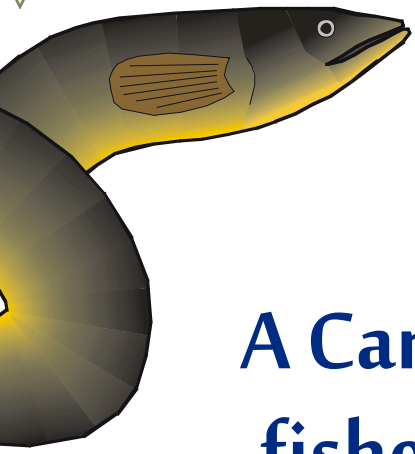
# But fisheries is only one of many impacts . . .



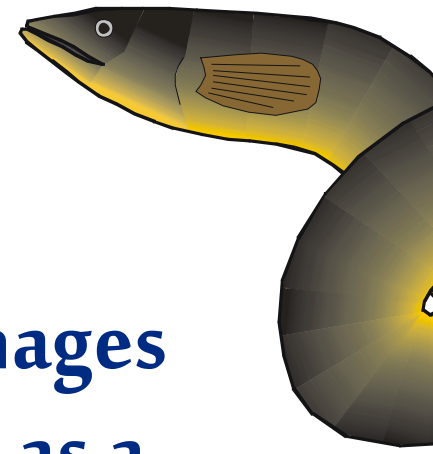


Entire stock

A fully comprehensive management regime would cover many non-fisheries issues across the stock range.

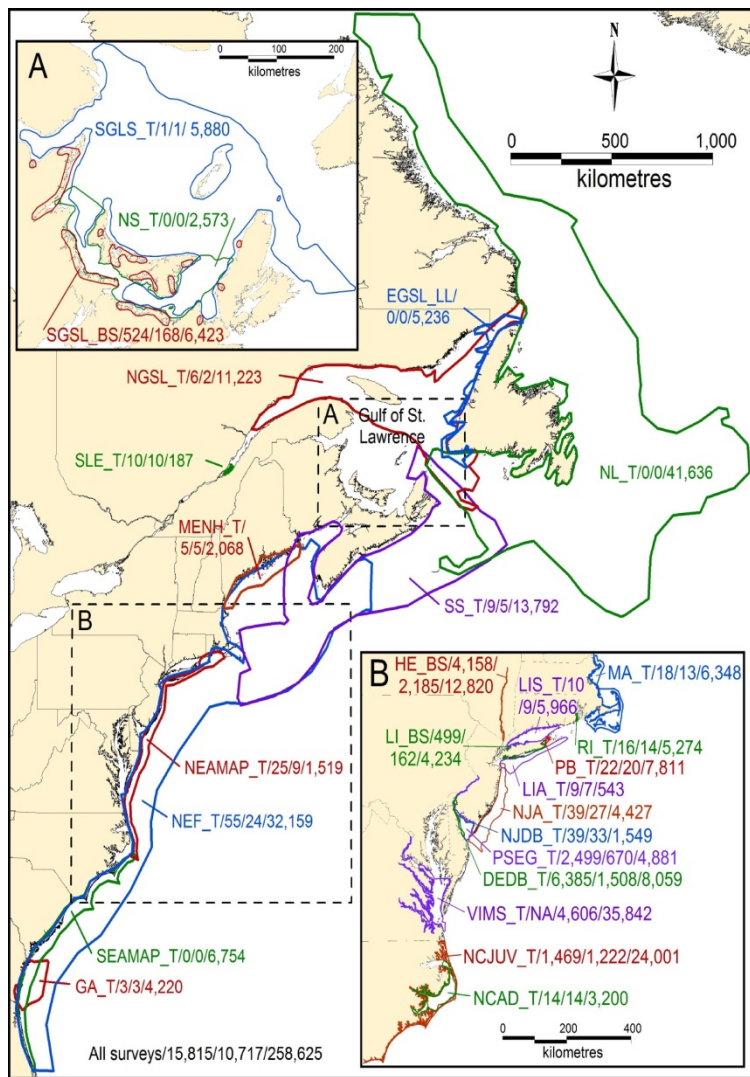


# Conclusion

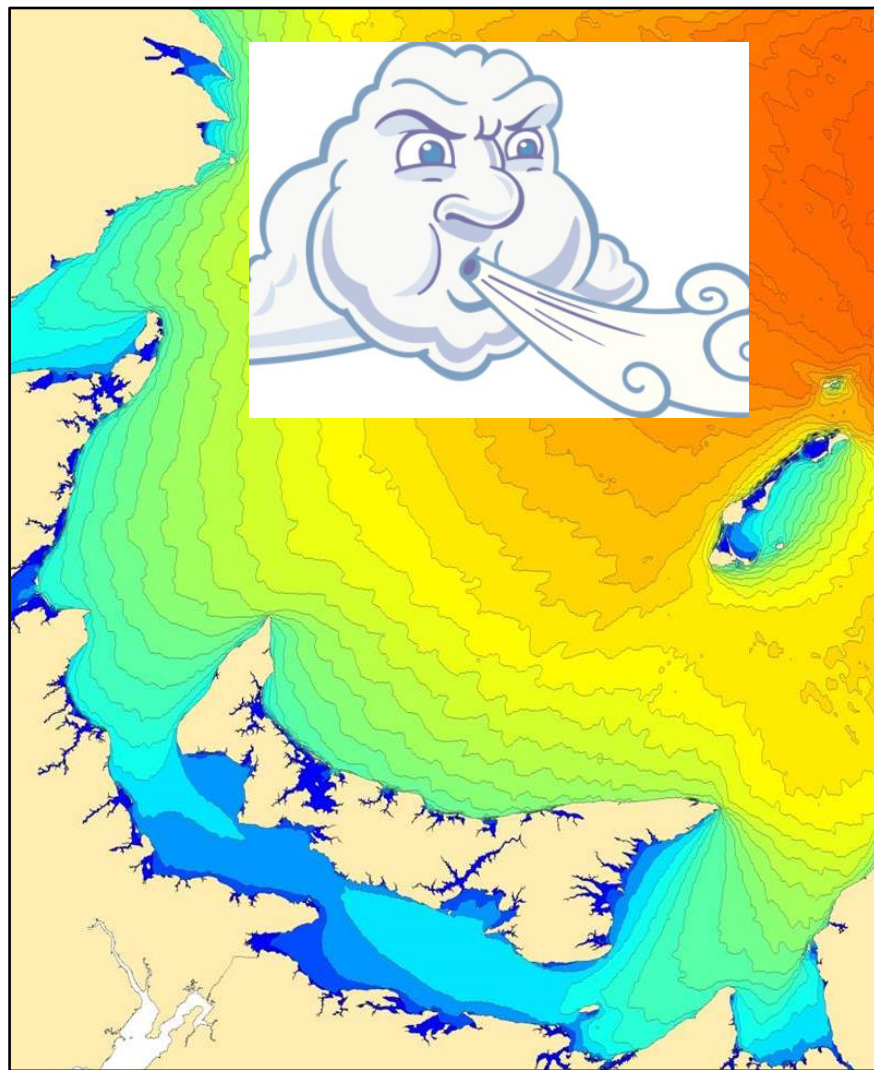


**A Canada-US collaboration that manages fisheries only, but which also serves as a forum to discuss other conservation issues, is a realistic medium-term goal.**

# Getting a head start on international science



Poirier et al., ICES J. Mar. Sci, submitted



Cairns in prep., Atlas and classification of aquatic habitat by wind fetch