

The End of the Blue Frontier: Spatial Planning in the Sea

Elliott A. Norse



Special thanks to

- Tom Bigford and NOAA Fisheries Habitat Conservation
- National Center for Ecological Analysis and Synthesis working group on *Ocean Zoning as an EBM Tool*
- UNESCO working group on *Marine Spatial Planning*
- Charlie Wahle, NOAA MPA Center & Lance Morgan, MCBI
- Larry Crowder, Duke University Marine Lab
- Steve Gaines, University of California-Santa Barbara





**We have to find new ways
to get more ocean areas
protected, Elliott**

**Nancy Foster
1941-2000**



The freedom of the frontier is a powerful idea for Americans



Key books on frontier human impacts

Alfred W. Crosby (1986) *Ecological Imperialism: The Biological Expansion of Europe, 900-1900*

Jared Diamond (1997) *Guns, Germs, and Steel: The Fates of Human Societies*

Jared Diamond (2005) *Collapse: How Societies Choose to Fail or Succeed*

Tim Flannery (1994) *The Future Eaters: An Ecological History of the Australasian Lands and People*

Tim Flannery (2001) *The Eternal Frontier: An Ecological History of North America and its Peoples*



Economically, frontiers are places

- 1) to extract and process natural resources, then move on
- 2) where resource use is extensive and wasteful



Legal characteristics of frontiers include



- 1) open access to resources
- 2) larger jurisdictions than non-frontier areas
- 3) few laws that effectively constrain resource exploitation



Ecologically, frontier activities

1) reduce biodiversity

a) eliminate higher trophic level species, decapitating food webs

b) eliminate structure-forming species, reducing habitat complexity

2) disrupt biogeochemical cycles

**In 1800, 30-60 million bison
roamed North America's lands**

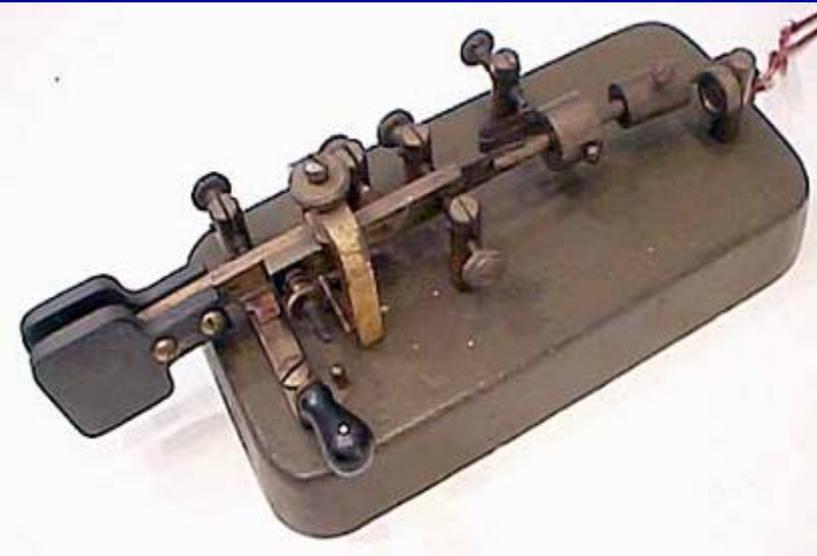


In 1800, 5 billion passenger pigeons roamed North America's skies



What killed them off?

Our “frontier mentality” and 2 new technologies

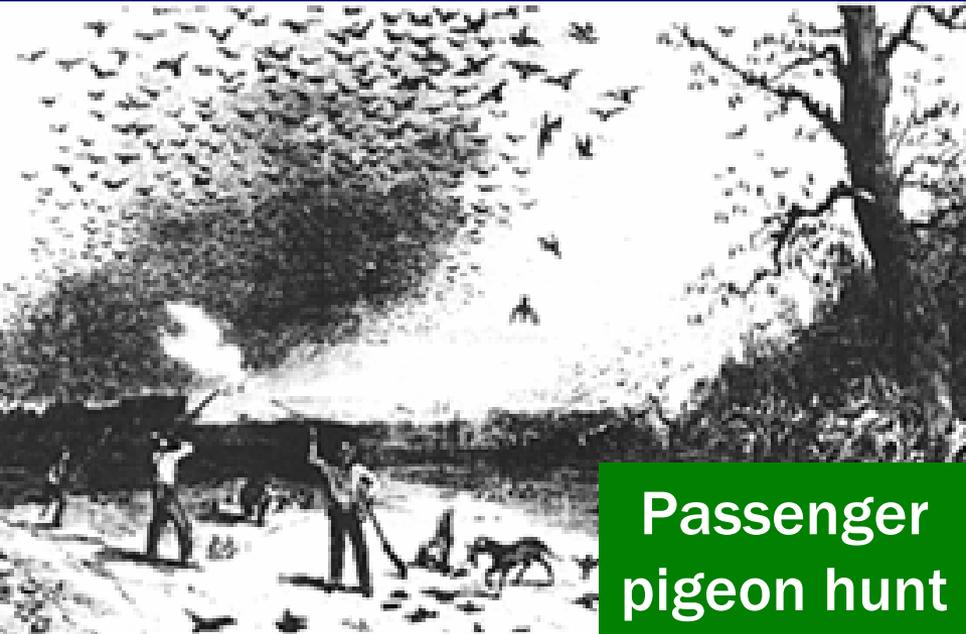


David Blockstein (2002) Passenger pigeon

The Birds of North America, # 611

A. Poole and F. Gill, eds.

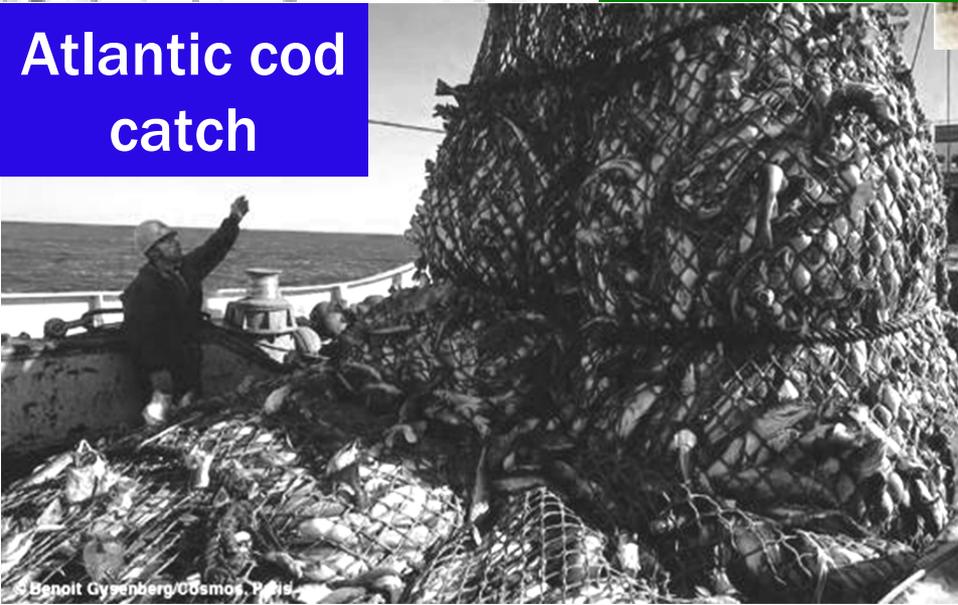
What does this have to do with the sea?



Passenger
pigeon hunt



Bison skulls



Atlantic cod
catch



Oyster
shells

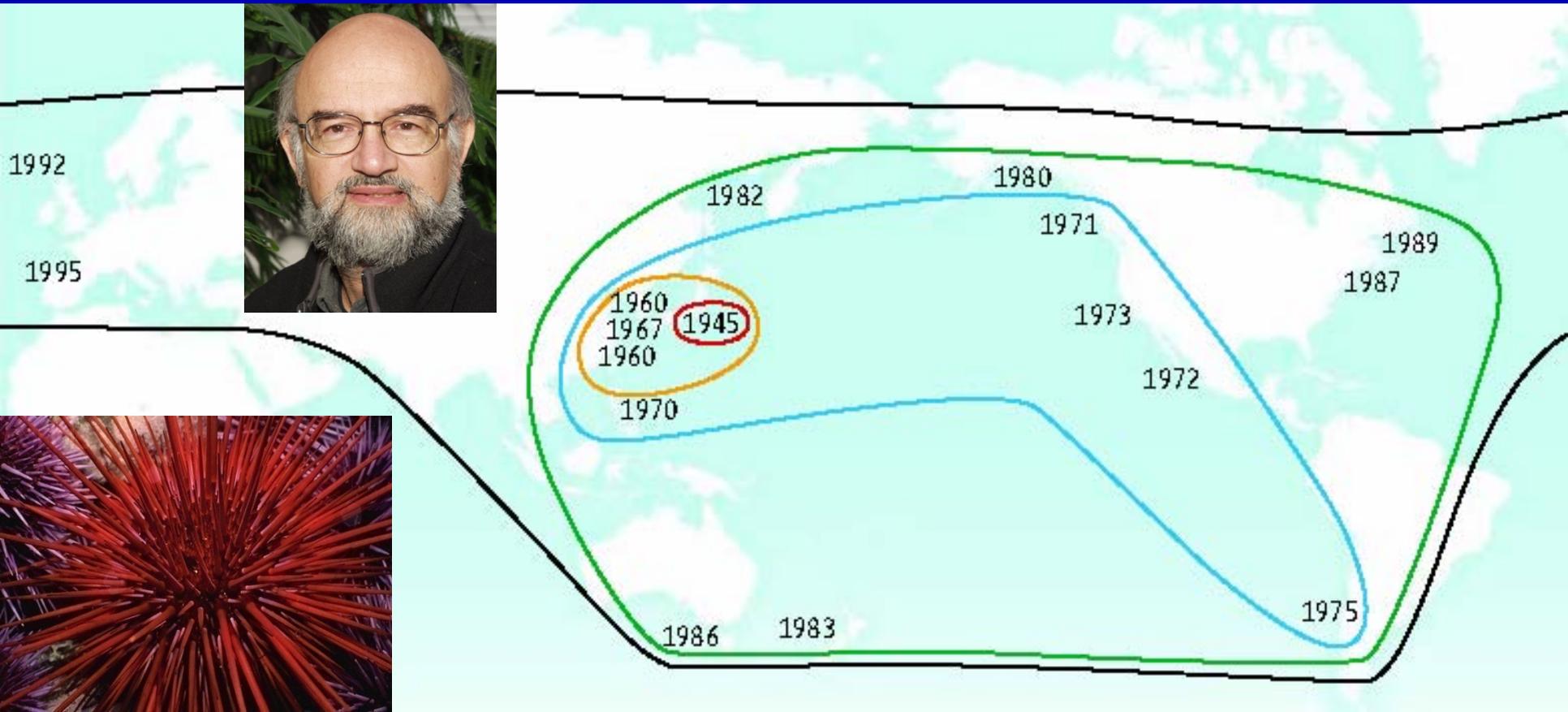
Fishing has changed dramatically

	Previously	Now
Hull	Wood	Steel
Propulsion	Wind	Fossil fuel
Gear	Natural fiber	Synthetic fiber
Navigation	Sun & stars	GPS & radio
Fish-finding	Trial & error	Sonar & satellite
Preserving	Few options	On-board freezing & processing
	Limited mobility & fishing power	Devastating mobility & fishing power

Unlimited mobility allows fishermen to overexploit ecosystems and move on

F. Berkes et al. (2006). *Science* 311: 1557-1558

Globalization, roving bandits and marine resources



**US ocean governance now allows
fishing boats almost unlimited mobility**



Unmistakable ecosystem indicators

- 1) Fisheries
- 2) Megafauna



- 3) Habitat-formers
- 4) Noxious species





The frontier days are ending

1893:

**Historian Frederick Jackson Turner
proclaimed the closing
of America's (land) frontier**



2003:

**Pew Oceans Commission said the
“frontier mentality” leads to a
hodgepodge of US laws & programs**

Essential conditions for sustainability

- Peoples' mobility was limited
- Users knew resource limitations in their places
- Societies decided who could fish where & when and enforced this privilege effectively



New activities are claiming more ocean space

Previously

- Ships
- Telegraph cables



Now or soon

- *Much* bigger ships
- Oil & gas
- LNG
- Power lines
- Wind farms
- Wave power
- Tidal power
- Telecom cables
- Aquaculture
- Marine reserves



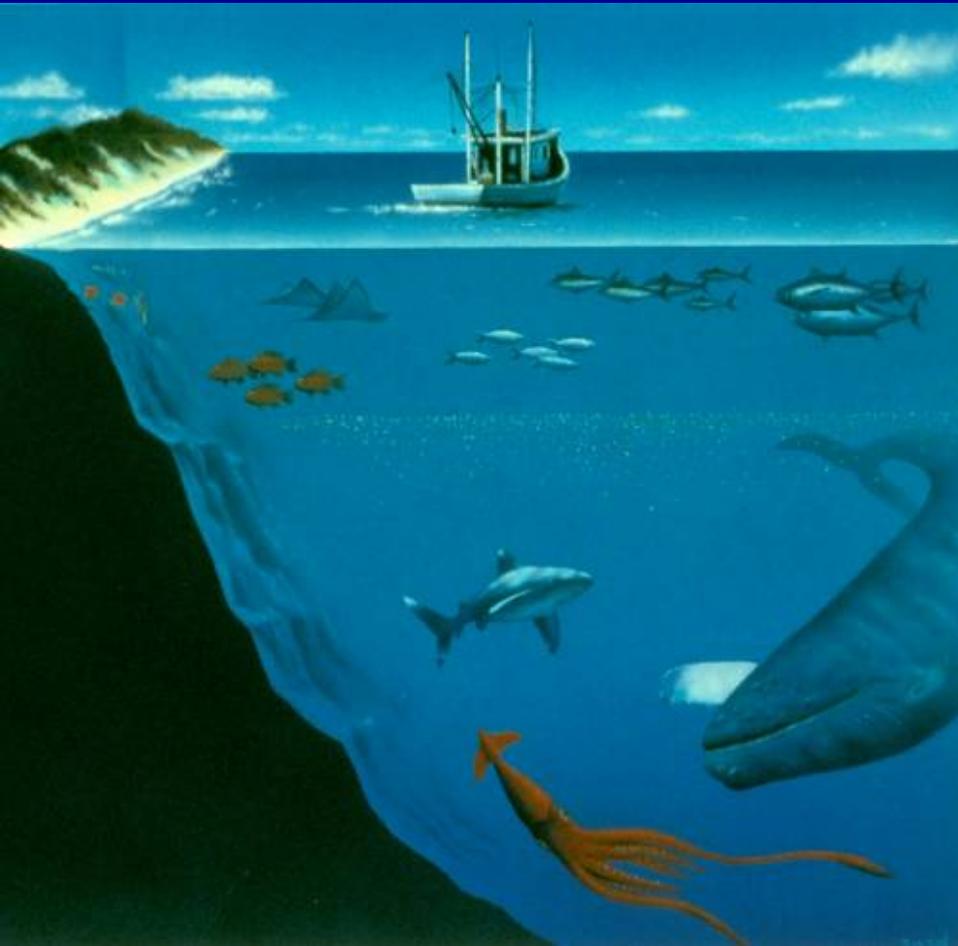
Our oceans are a public trust for *all* Americans



M. Turnipseed, L.B. Crowder,
R.D. Sagarin and S.E. Roady (2009)

Legal bedrock for rebuilding
America's ocean ecosystems
Science 324: 183-184

Blue-ribbon panels call for marine ecosystem-based management



- National Academy of Sciences' NRC (1999)
- Pew Oceans Commission (2003)
- US Commission on Ocean Policy (2004)
- Joint Ocean Commission Initiative (2009)

What is ecosystem-based management?

- An integrated approach that considers the entire ecosystem, including humans
- Emphasizes protection of ecosystem composition, structure and function
- Sustains ecosystem productivity and resilience by maintaining interconnections
- Is *spatial*, focusing on a place or mosaic of places



What about marine reserves and other MPAs?





In 2000, MCBI persuaded President Clinton to issue an Executive Order establishing a national system of MPAs

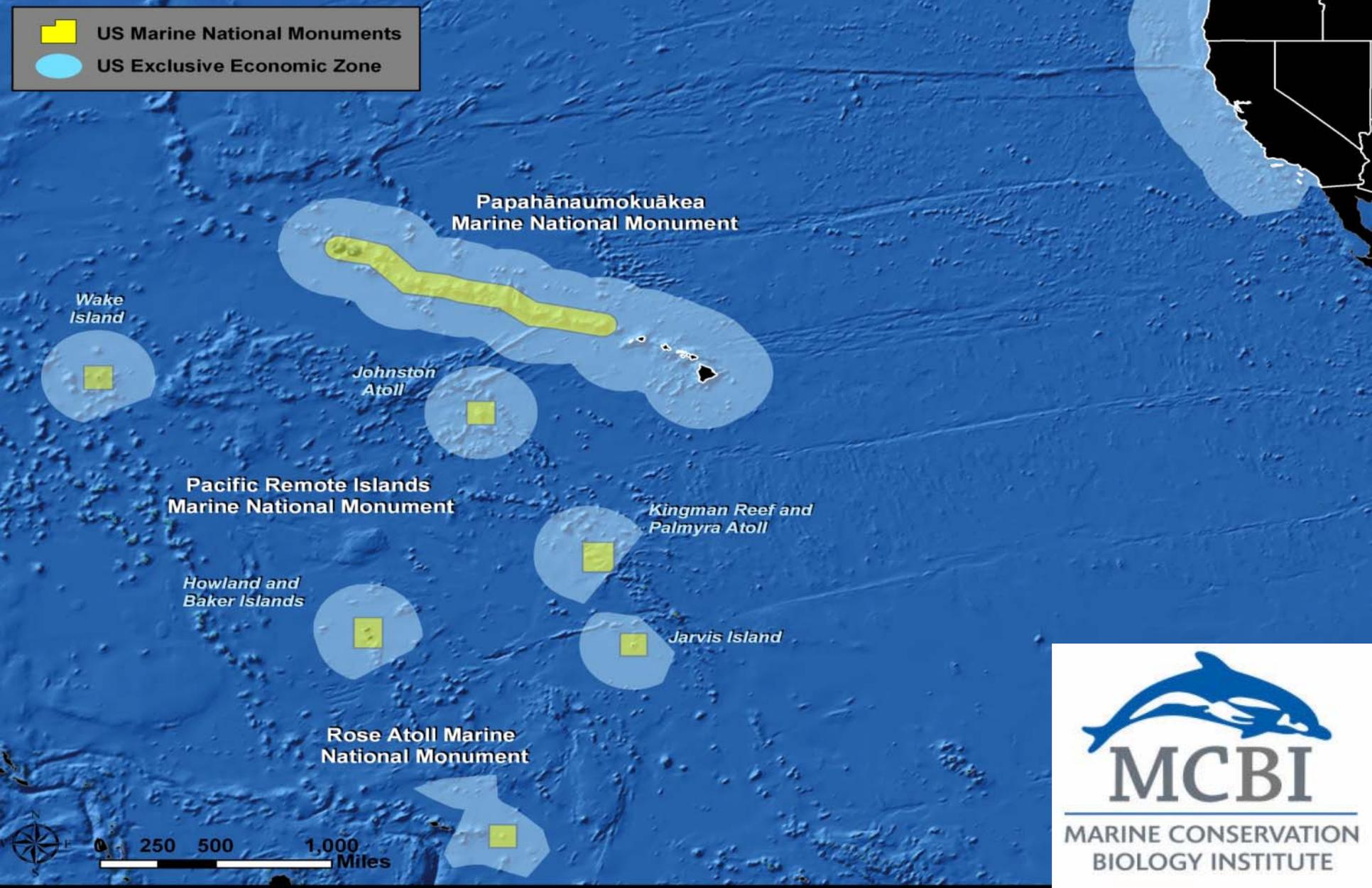


In 2006 & '09, MCBI & EDF persuaded President Bush to create 3 Marine National Monuments

They protect extraordinary places

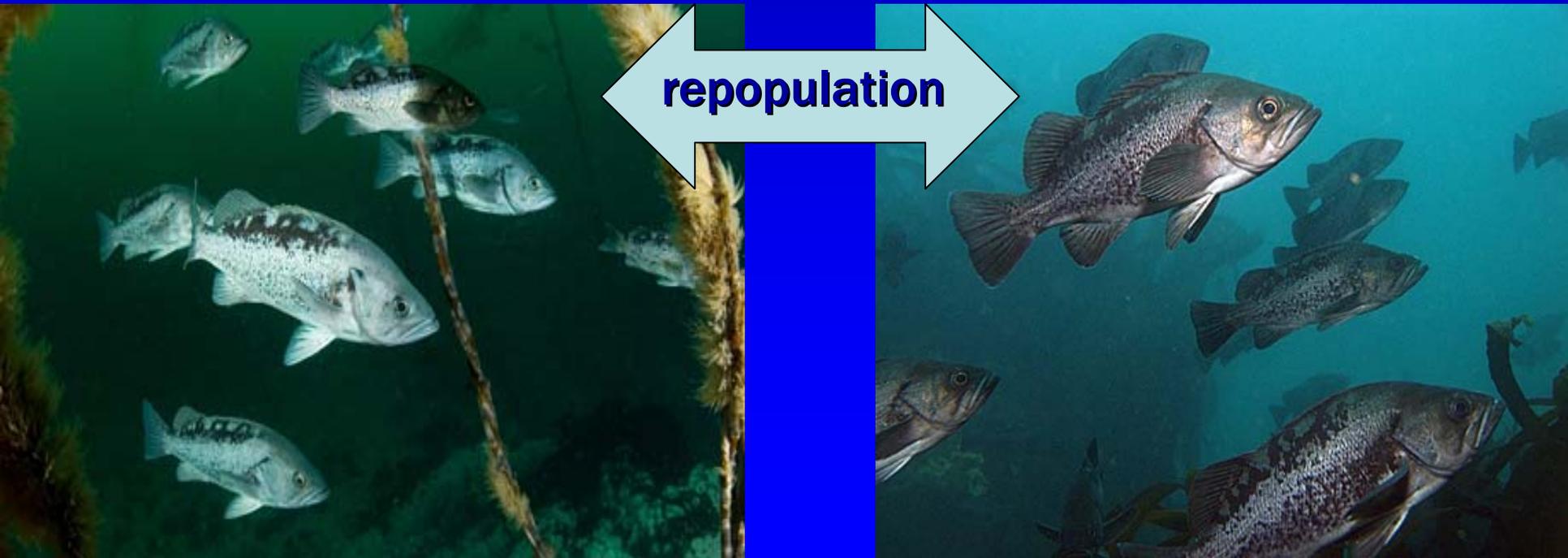


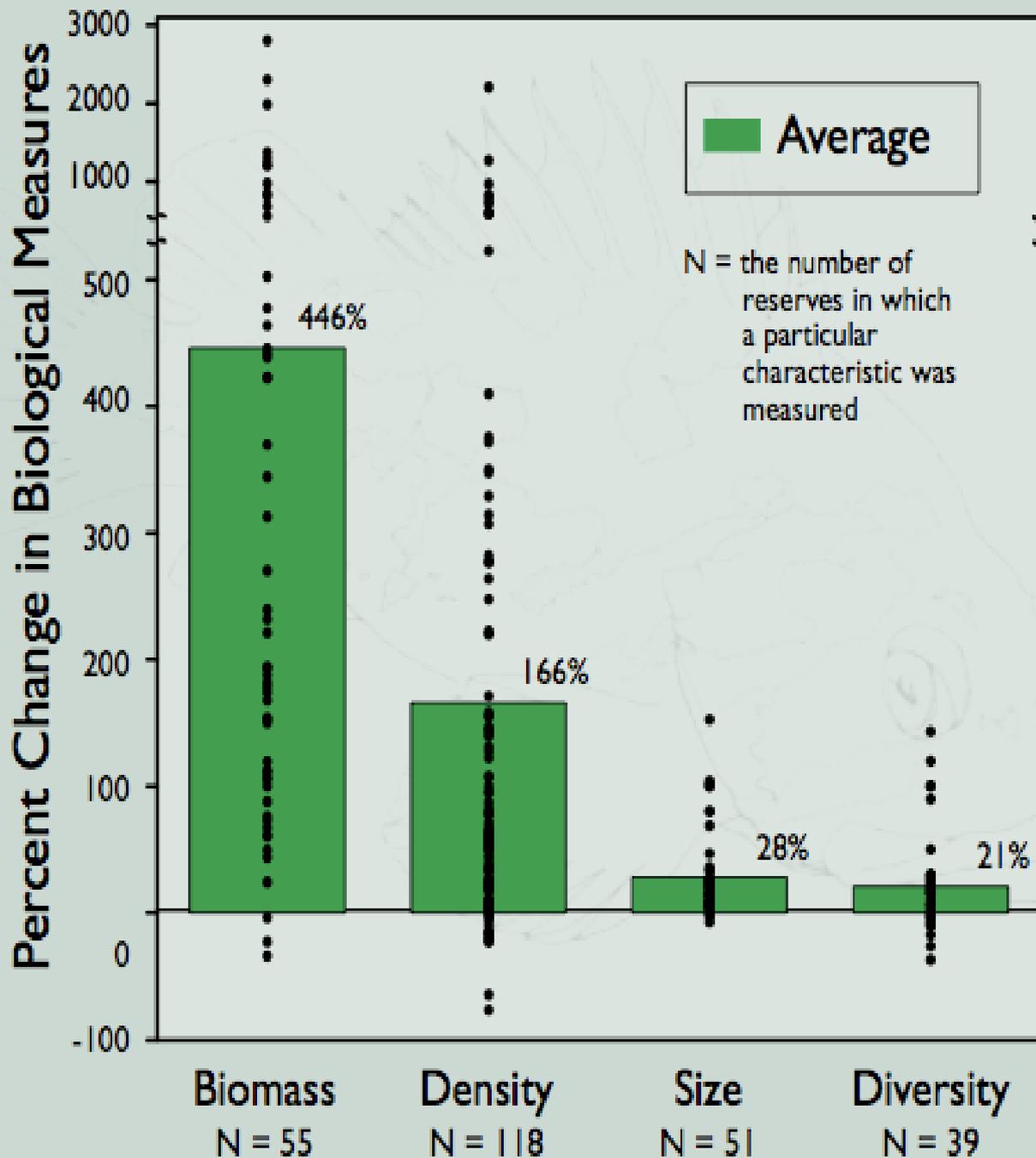
Together, these are the world's biggest MPAs



Networks of no-take marine reserves are an **essential** marine conservation tool

- Some things happen **only** in highly protected places
- Connectivity within MPA networks is the basis for **metapopulation dynamics and resilience**



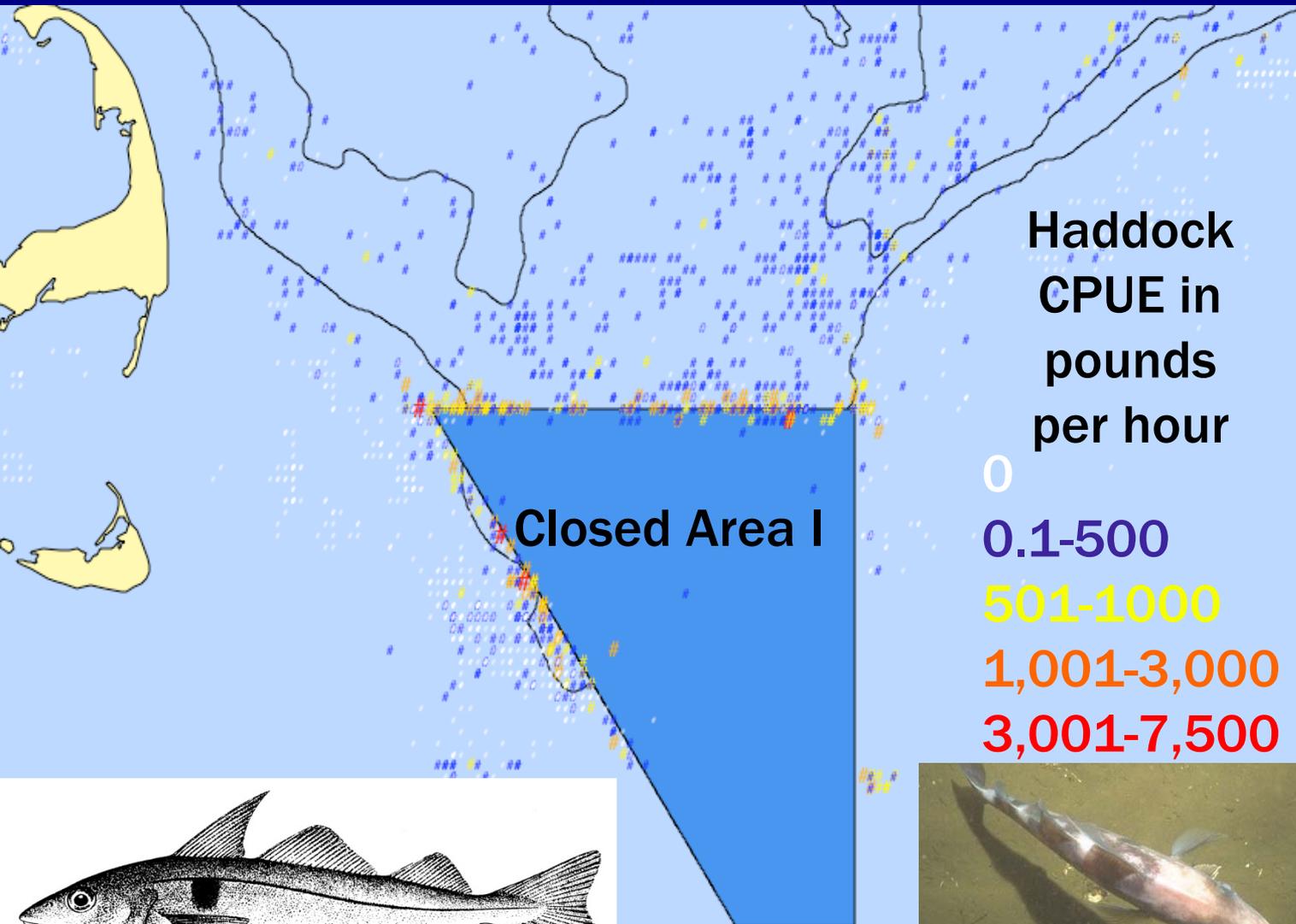


There are big effects within reserves

**More biomass
More animals
Larger animals
More species**

**Lester *et al.* in review
Halpern 2003**

Fishermen *know* that reserves export fish



Haddock
CPUE in
pounds
per hour

0

0.1-500

501-1000

1,001-3,000

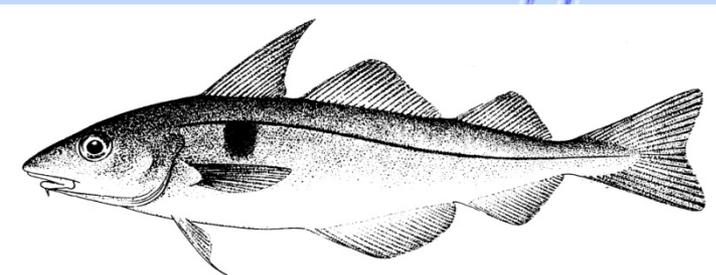
3,001-7,500

Closed Area I

Total Yield

42% within
1 km

73% within
5 km



**I hope 31 years of work on MPAs
give me credibility to say what follows**



MPAs are essential but not sufficient

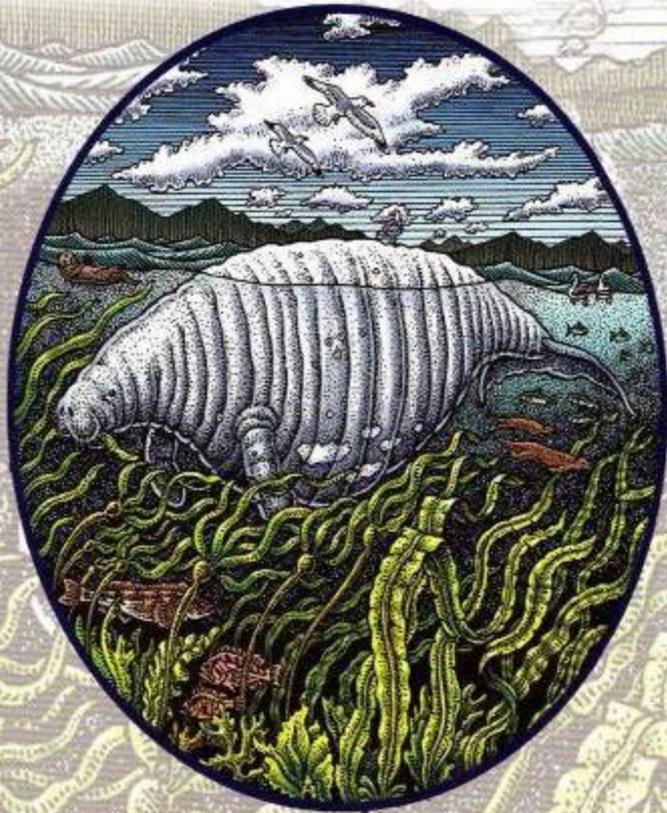


Now users fight for **every bit** of ocean space
out of fear they won't get **any**



Marine Conservation Biology

THE SCIENCE OF MAINTAINING THE SEA'S BIODIVERSITY



Edited by Elliott A. Norse and Larry B. Crowder

Foreword by Michael E. Soulé

Marine Conservation Biology Institute

E.A. Norse (2005). Ending the range wars on the last frontier: Zoning the sea

pp. 422-443 in:

E.A. Norse & L.B. Crowder

***Marine Conservation Biology: The Science of Maintaining the Sea's Biodiversity.* Island Press**

The *biggest* difference in governance on land and in the sea

- On land, one authority generally governs all sectors in the same place
- In the sea, different authorities generally govern different sectors in the same place



Ocean sectors are managed separately

- **Fisheries:** NOAA Fisheries
- **Aquaculture:** ?NOAA Fisheries?
- **Oil & gas, wind:** Minerals Management Service
- **Wave, tidal, LNG:** Federal Energy Regulatory Commission
- **Pipelines , dredging:** Army Corps of Engineers
- **Sonar testing:** Navy
- **Discharges:** Environmental Protection Agency
- **Non-consumptive recreation:** nobody
- **Biological diversity conservation:** nobody

What's wrong with sectoral management?

- Regulatory capture violates public trust
- Unending conflict & high costs for users
- Biodiversity **always** loses



**This paper explains why sectoral management is
so harmful ecologically and economically**

Resolving mismatches in U.S. ocean governance
Science 313: 617-618



**L.B. Crowder, G. Osherenko, O.R. Young,
S. Aíramé, E.A. Norse, N. Baron,
J.C. Day, F. Douvère, C.N. Ehler,
B.S. Halpern, S.J. Langdon,
K.L. McLeod, J.C. Ogden, R.E. Peach,
A.A. Rosenberg & J.A. Wilson (2006)**

Major findings of Crowder et al. (2006)

- 1) Governance is not configured to manage oceans
 - Governance is **fragmented**, with **overlaps** and **gaps** in authority
 - Governance and natural processes happen on different **spatial** and **temporal** scales
- 2) Comprehensive ecosystem-based management using **zoning** can alleviate these problems







Ecosystem-based spatial management using planning and zoning

- Addresses the **spatial heterogeneity** in ecosystems and human uses
- Separates **incompatible uses**
- Makes **win-win outcomes possible** for users and conservationists



**Some crucial things
happen only
in certain places**



Some uses are incompatible with each other



Parasailing

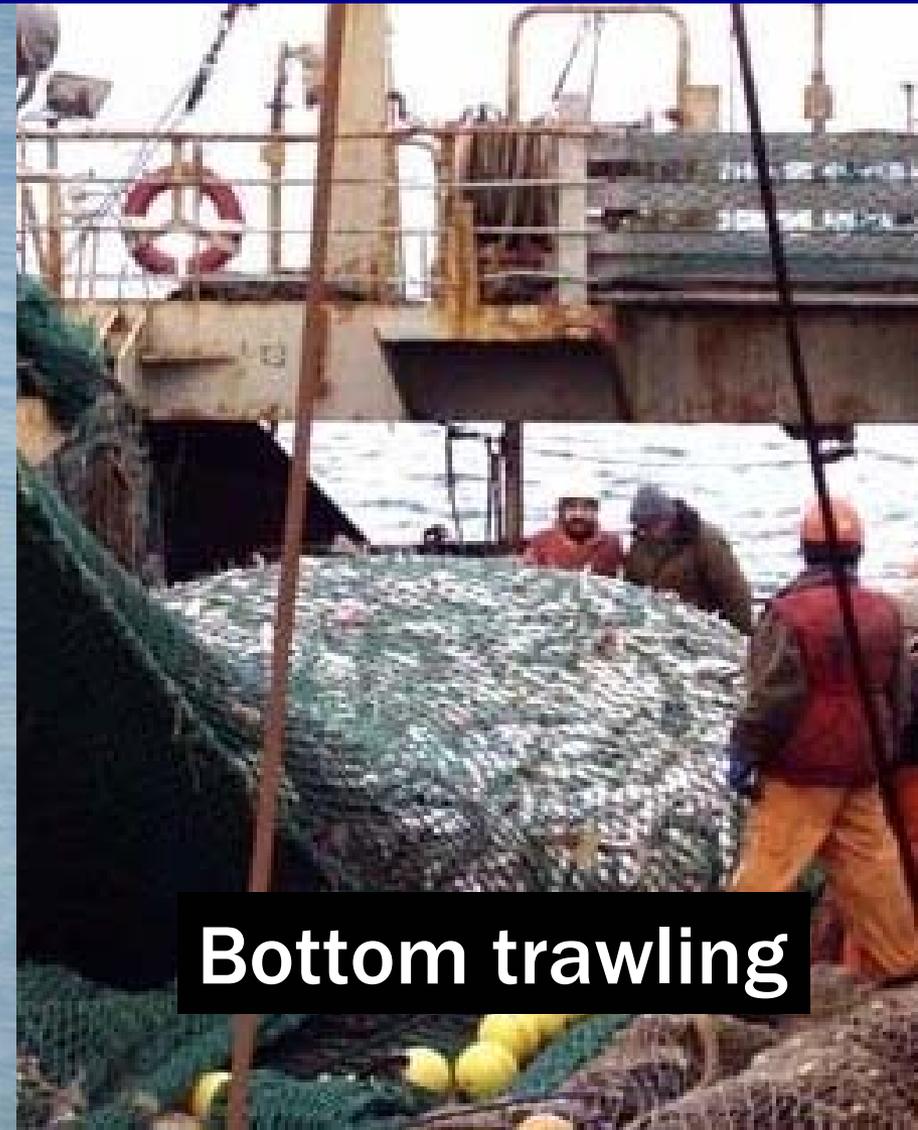


Wind Farms

Some fishing methods are incompatible with each other



Pot fishing

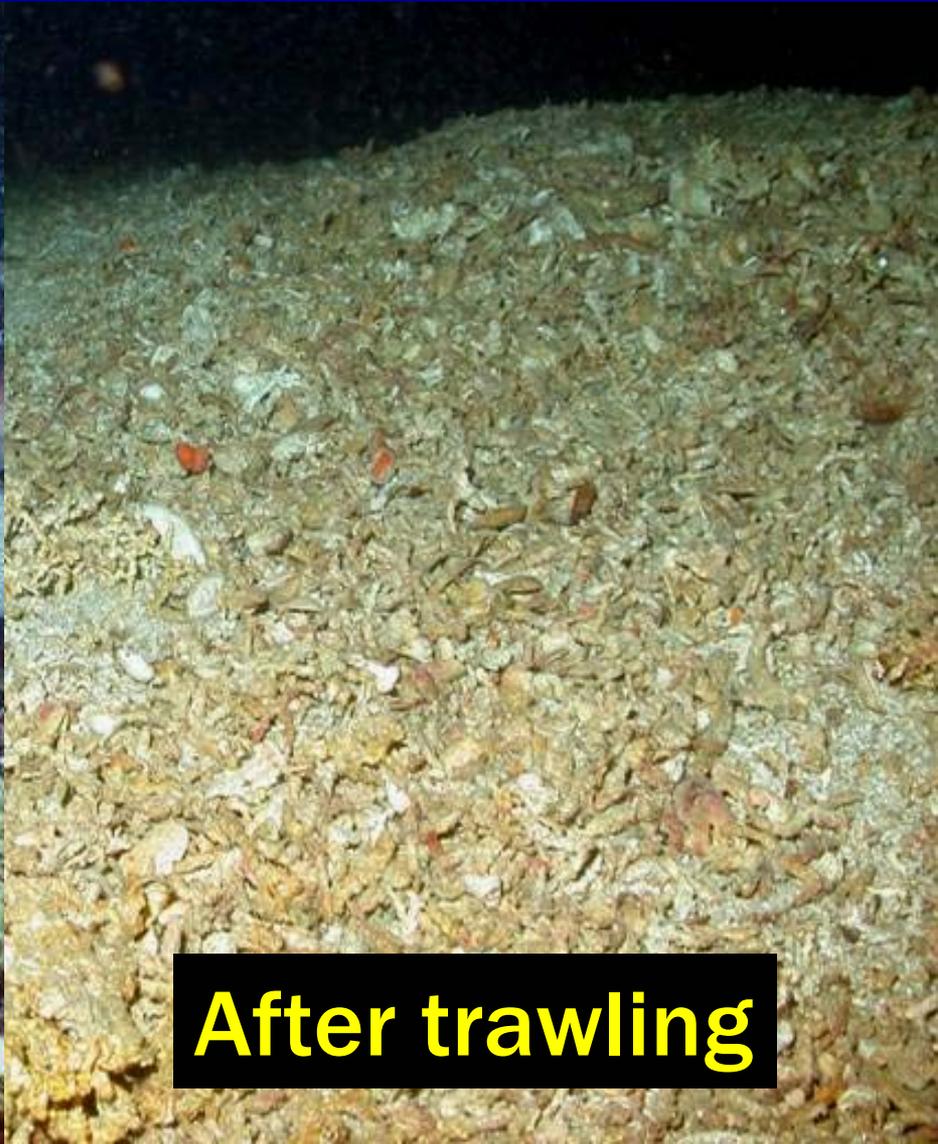


Bottom trawling

Some activities **cannot** be sustainable
Oculina deep-sea coral reefs, Florida



Before trawling



After trawling

Threats to marine ecosystems will increase unless we govern spatially

Trawling



Sonar testing



Rec fishing



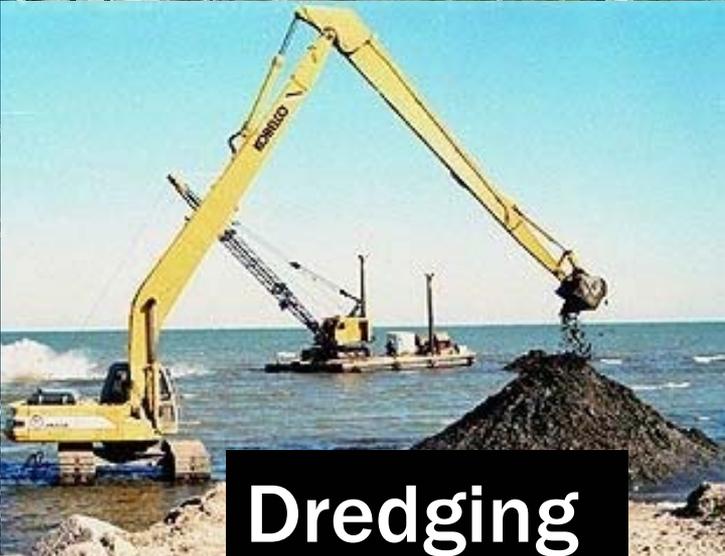
Shipping

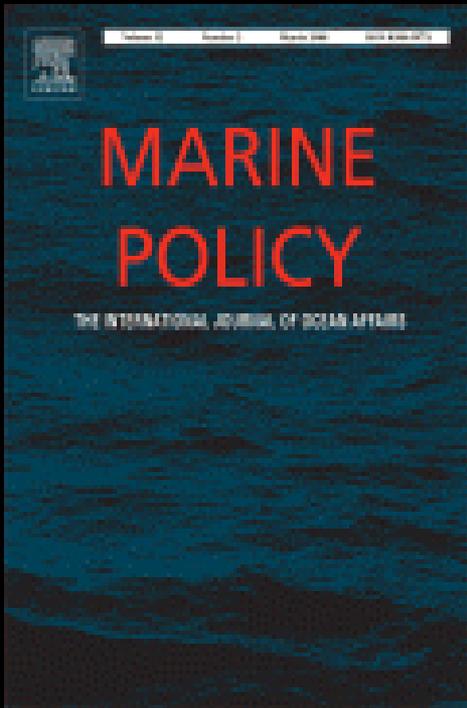


Development



Dredging





F. Douvère and C. Ehler, eds. (2008)
**The role of marine spatial planning
in implementing ecosystem-based
sea use management**
Marine Policy 32(5)



The UNESCO IOC/MAB Guidebook for Marine Spatial Planning



**Charles Ehler and
Fanny Douvère (2009)**

*Marine Spatial Planning: A Step-by-Step
Approach Toward Ecosystem-based
Management*

www.unesco-ioc-marinesp.be

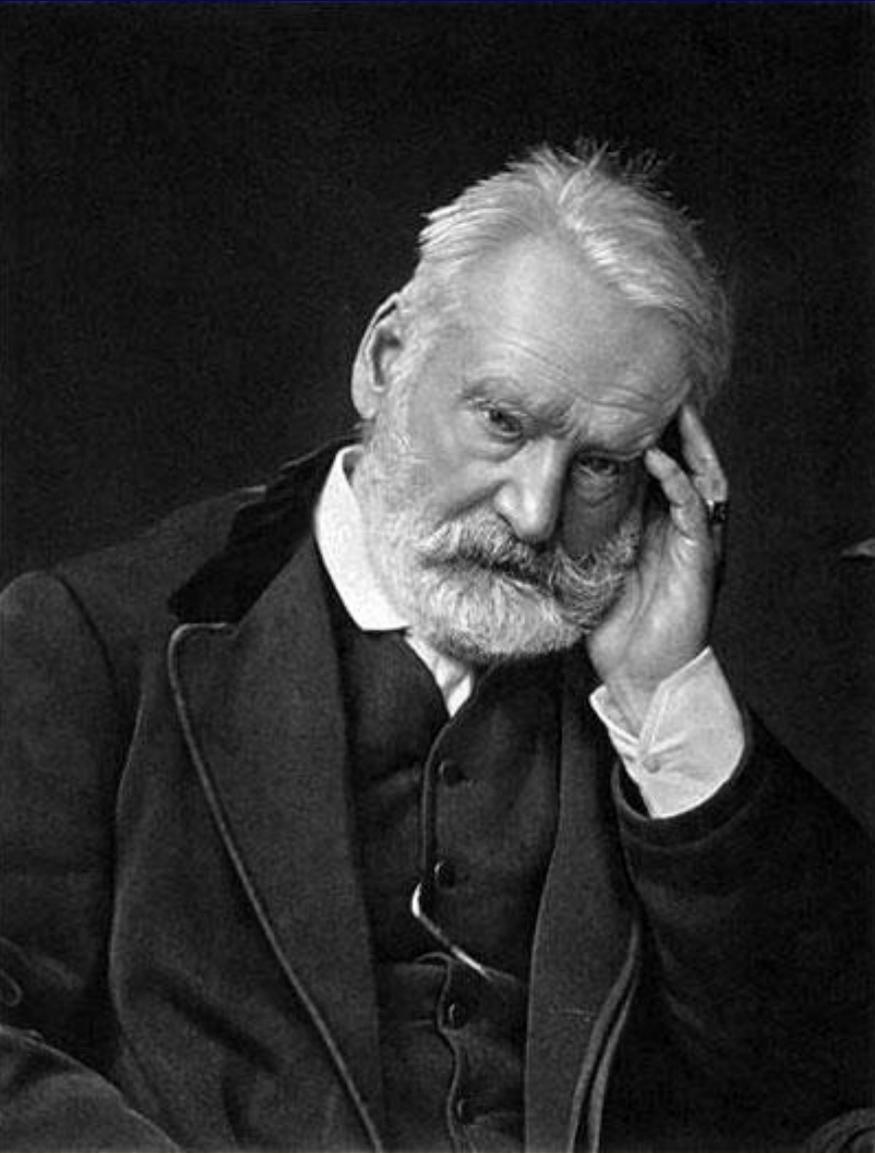
Comprehensive spatial management principles

- Establish the **twin goals** of protecting and recovering ecosystem services and economy/jobs
- Every area has **one** governing authority
- Map regions and human uses
- Zone each region including viable networks of marine reserves
- Reduce or eliminate unsustainable uses
- Separate incompatible uses
- Use best available natural and social science
- Make planning **transparent, inclusive and accountable**
- Use adaptive management

This Administration appears to be committed



I believe that sectoral management of different activities in the oceans does not serve us well and needs to be converted into a more thoughtful mechanism for doing more holistic planning in which... sectors' uses are compatible with one another in a particular place



**An invasion of armies
can be resisted,
but not an idea
whose time has come**

**Victor Hugo
1802-1885**



**Things do not happen.
Things are made to
happen.**

**John F. Kennedy
1917-1963**





Let's do it to honor Nancy Foster!