

Dynamic Ocean Management



Larry B. Crowder
Center for Ocean Solutions
and
Hopkins Marine Station

Current spatial management: Static MPAs

Dynamic Management

- a. What it is
- b. Case study: California Swordfish Fishery
- c. The Future

Alternate Shipping Lanes

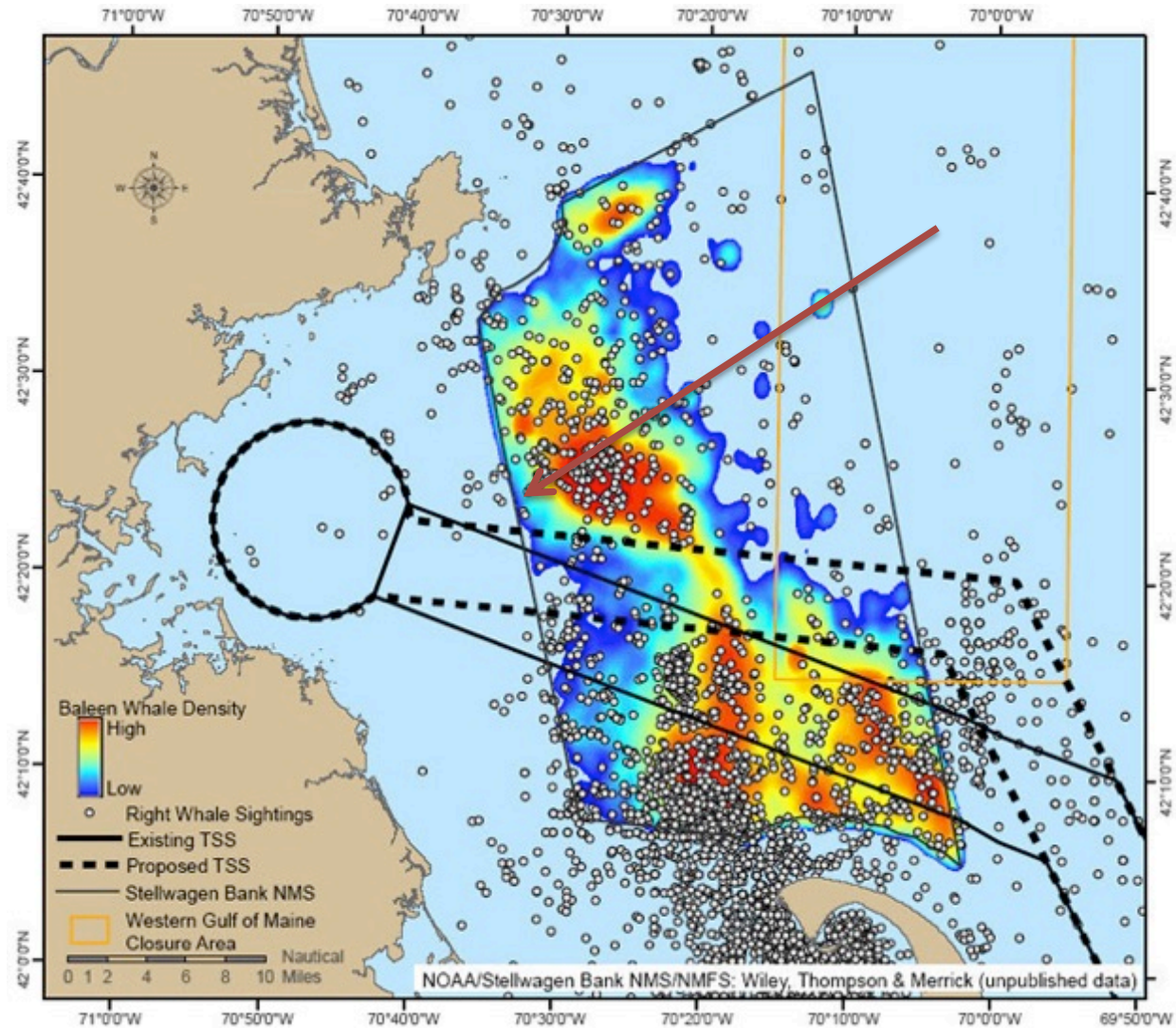


Image: Stellwagen Bank
National Marine
Sanctuary

Spatial Techniques: MPAs

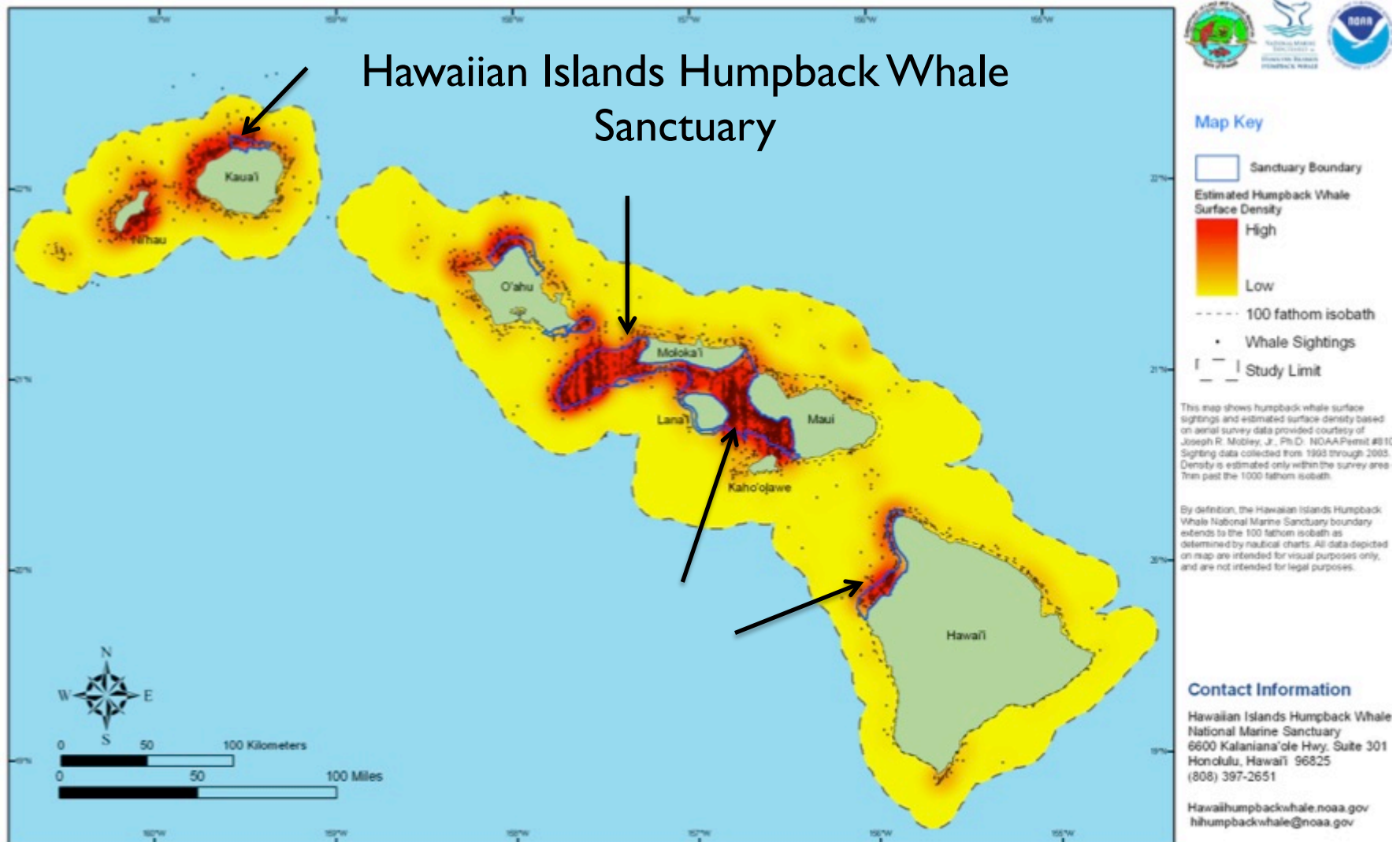
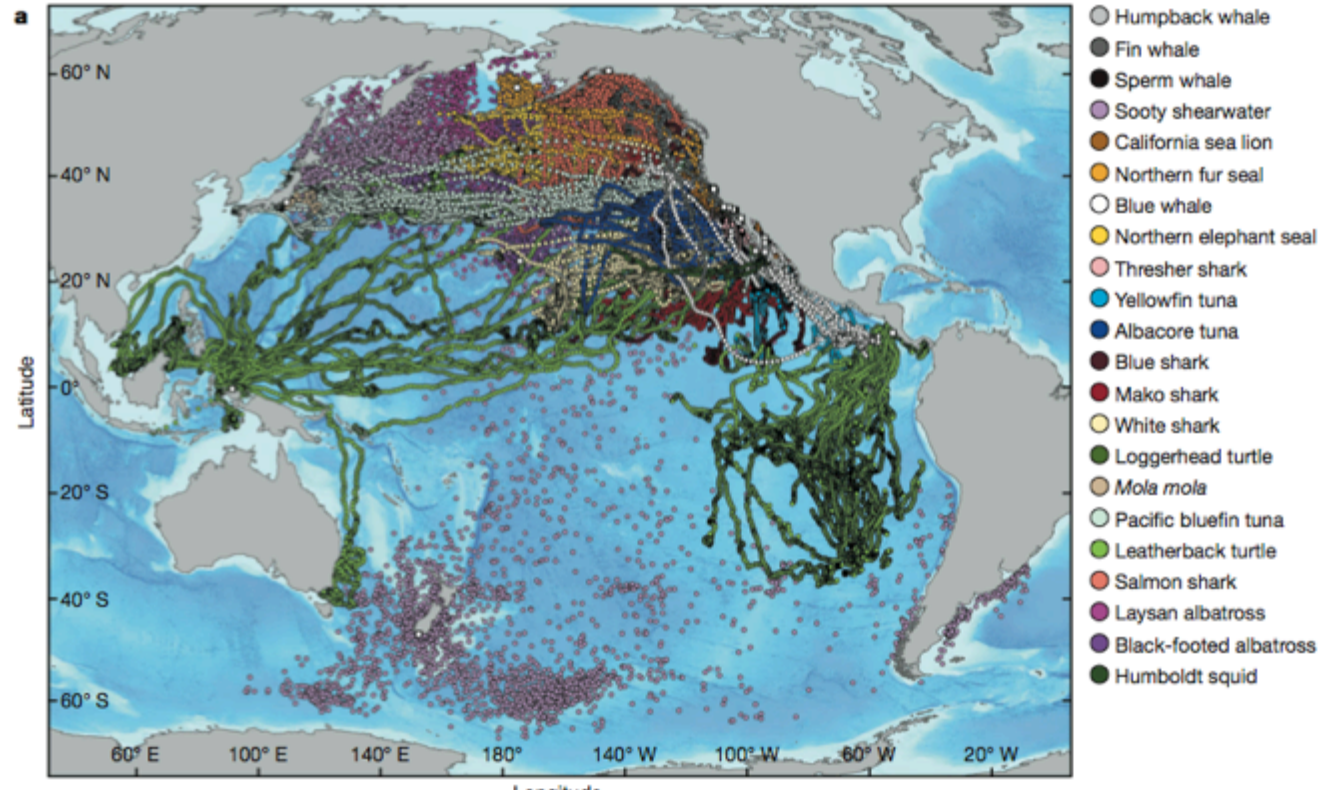
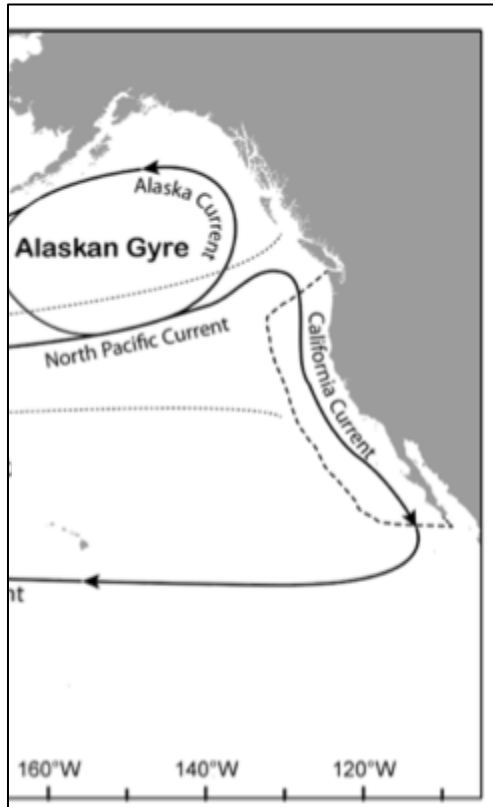


Image: Hawaiian Islands Humpback Whale
National Marine Sanctuary

Ocean Habitats



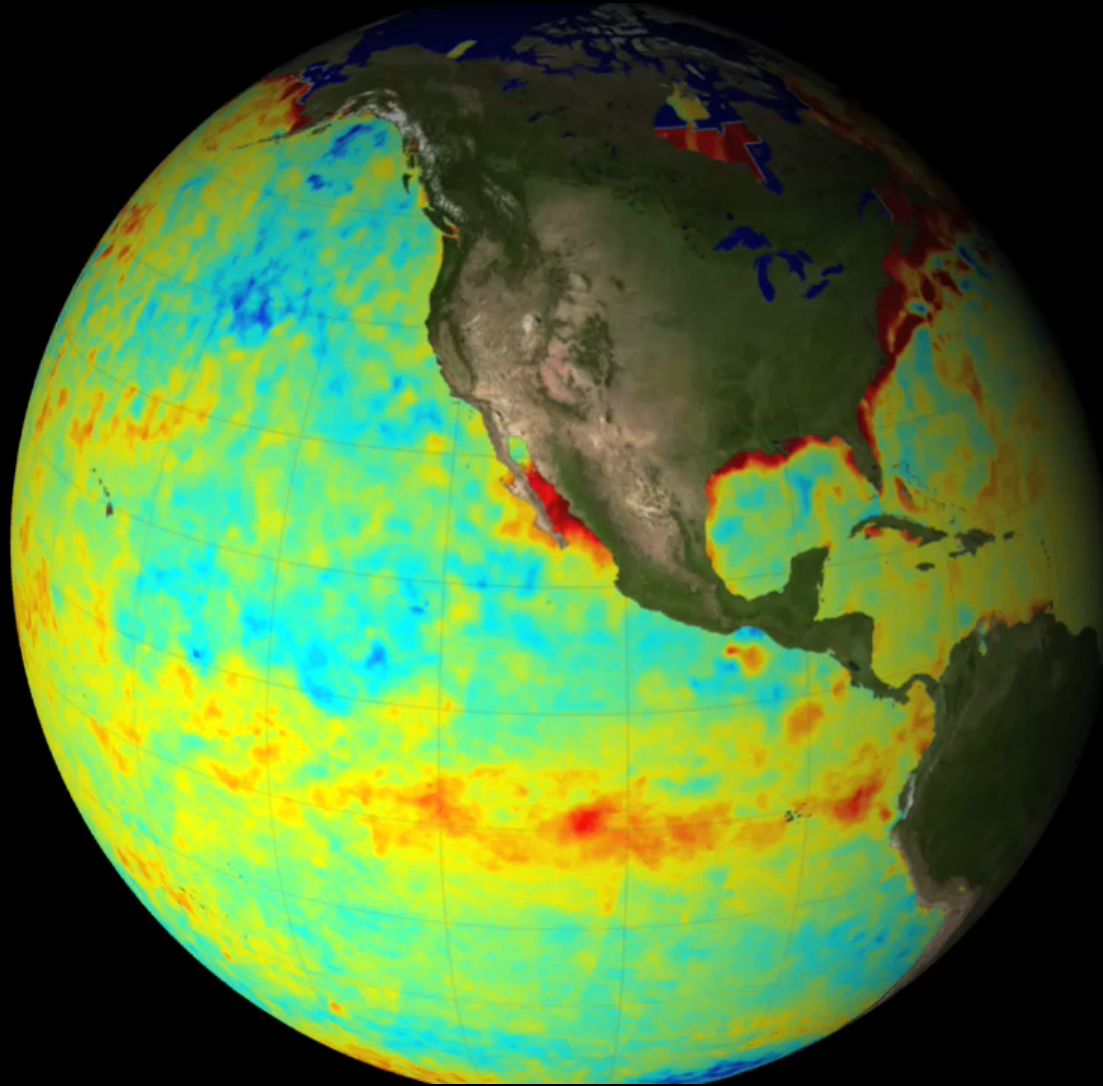
Block et al. 2011 | *Nature*

The California Current produces
cold, nutrient rich water

A Dynamic Ocean

DYNAMIC
MANAGEMENT

Jan 1 2007



Credit: NOAA



Marine Policy 58 (2015) 42–50



Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Management that changes in
space and time

in response to the shifting
nature of the ocean
and its users

based on the integration of
new biological,
oceanographic, social and/or
economic data

in near real-time

Dynamic ocean management: Defining and conceptualizing real-time management of the ocean

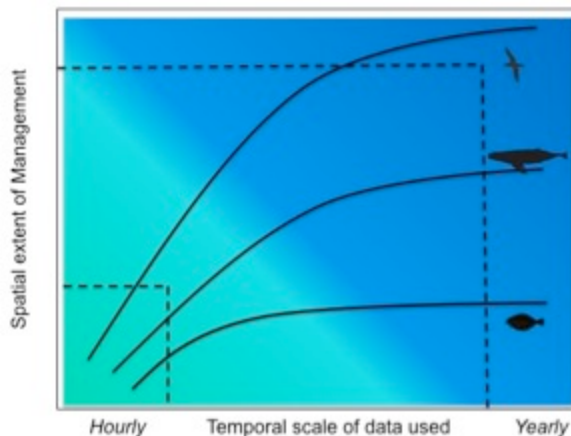
Sara M. Maxwell^{a,b,*}, Elliott L. Hazen^c, Rebecca L. Lewison^d, Daniel C. Dunn^e, Helen Bailey^f, Steven J. Bograd^c, Dana K. Briscoe^a, Sabrina Fossette^c, Alistair J. Hobday^g, Meredith Bennett^h, Scott Bensonⁱ, Margaret R. Caldwell^{h,j}, Daniel P. Costa^k, Heidi Dewar^l, Tomo Eguchiⁱ, Lucie Hazen^h, Suzanne Kohin^l, Tim Sippel^l, Larry B. Crowder^{a,h}

Dynamic Ocean Management

DYNAMIC
MANAGEMENT



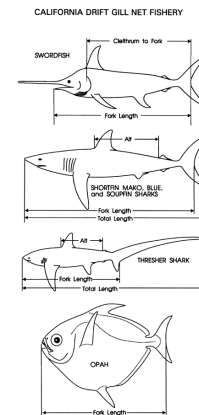
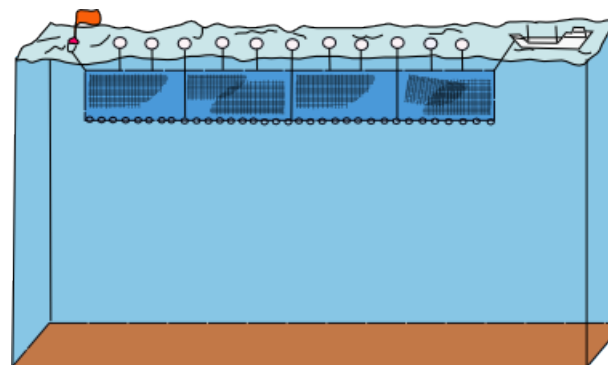
Conceptual Framework



Lewison et al (2015) *Bioscience*



Case Study: CA Drift Gillnet Fishery



National Marine Fisheries Service

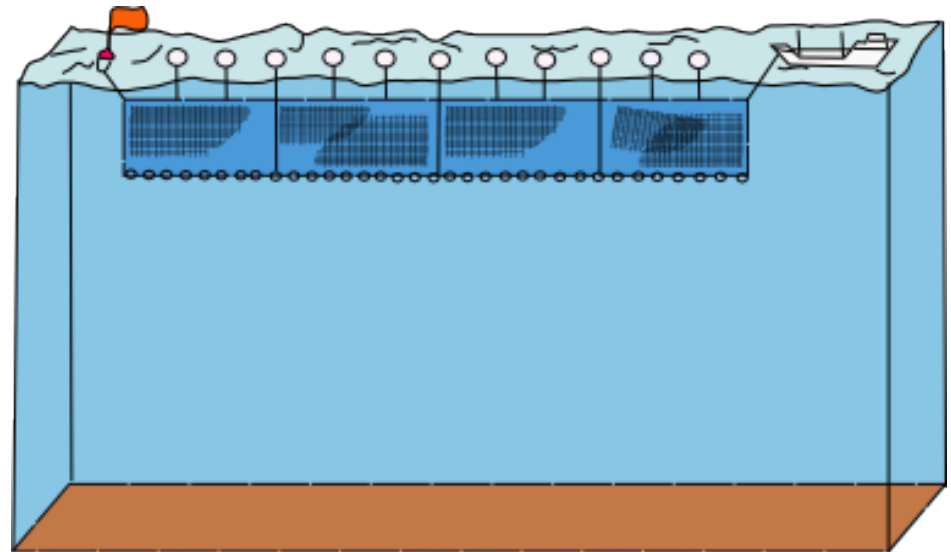
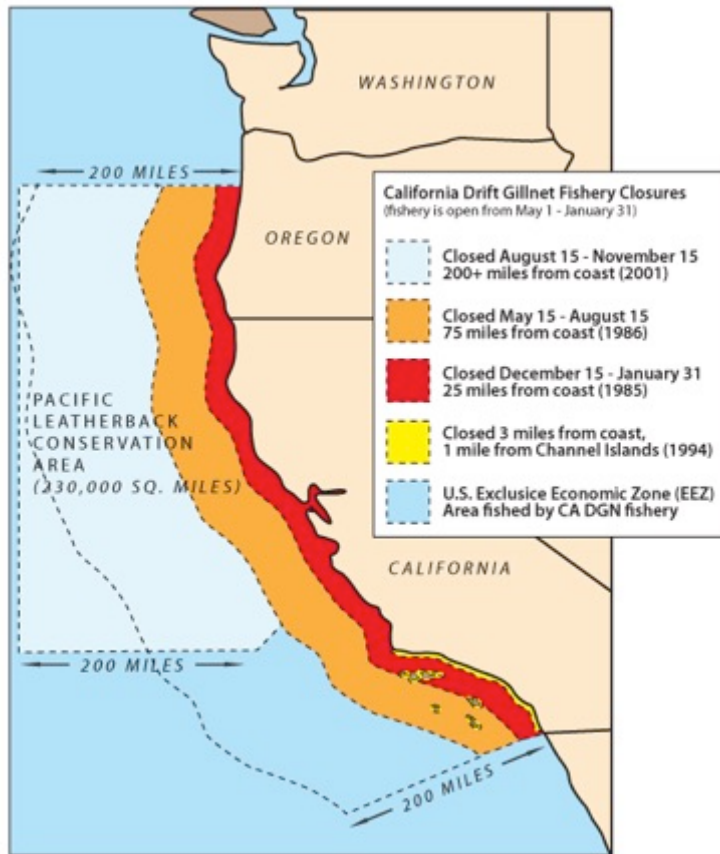


SAN DIEGO STATE
UNIVERSITY



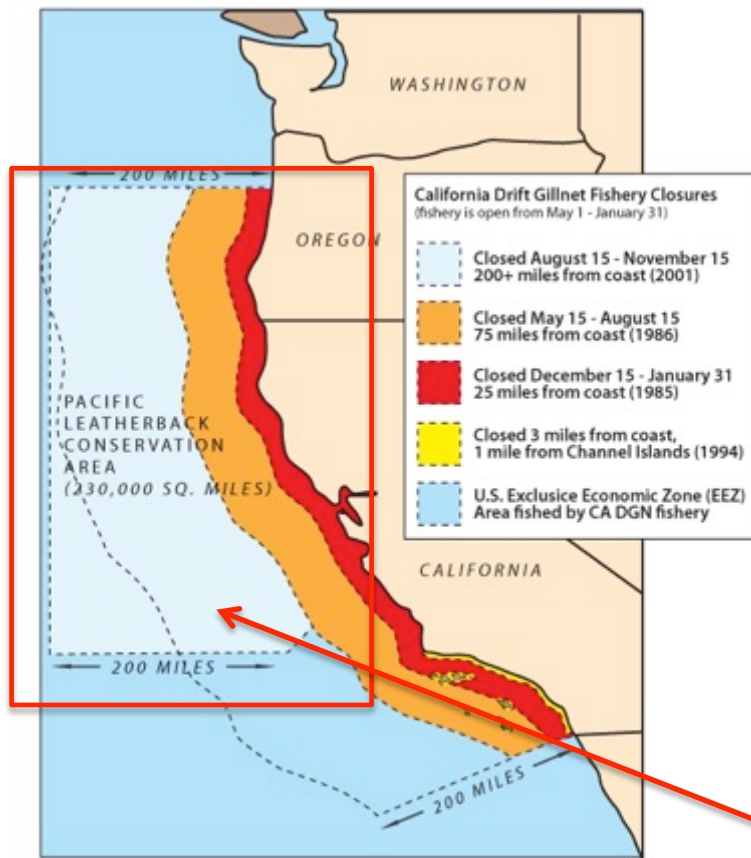
California Drift Gillnet Fishery

DYNAMIC MANAGEMENT:
Case Study

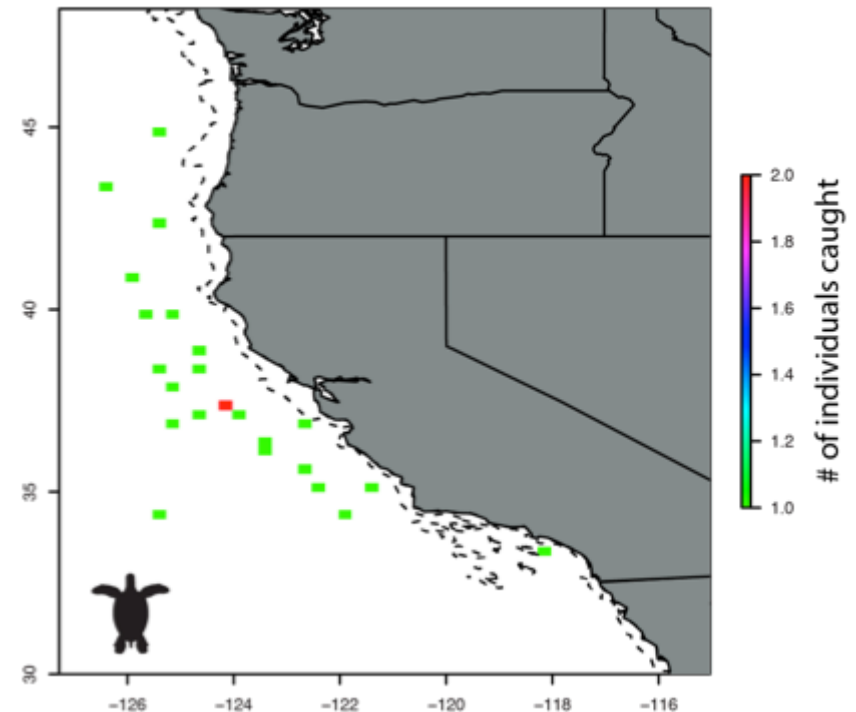


California Drift Gillnet Fishery

DYNAMIC MANAGEMENT:
Case Study



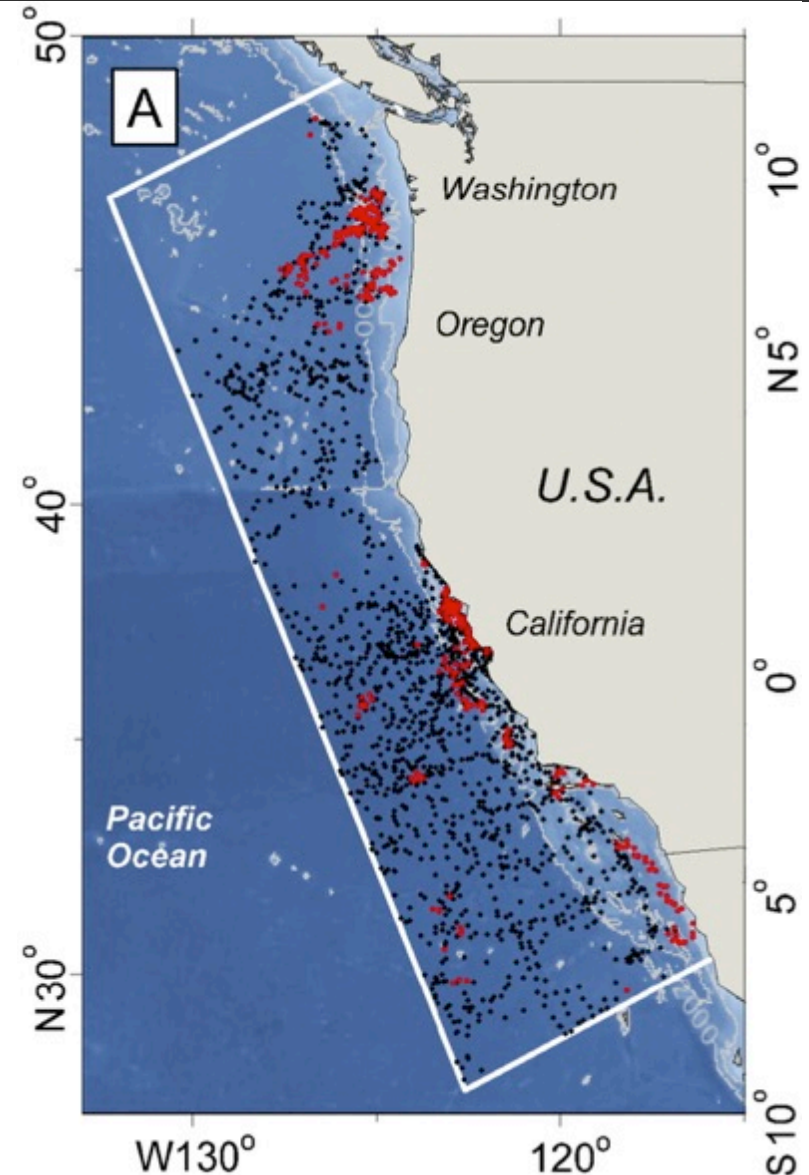
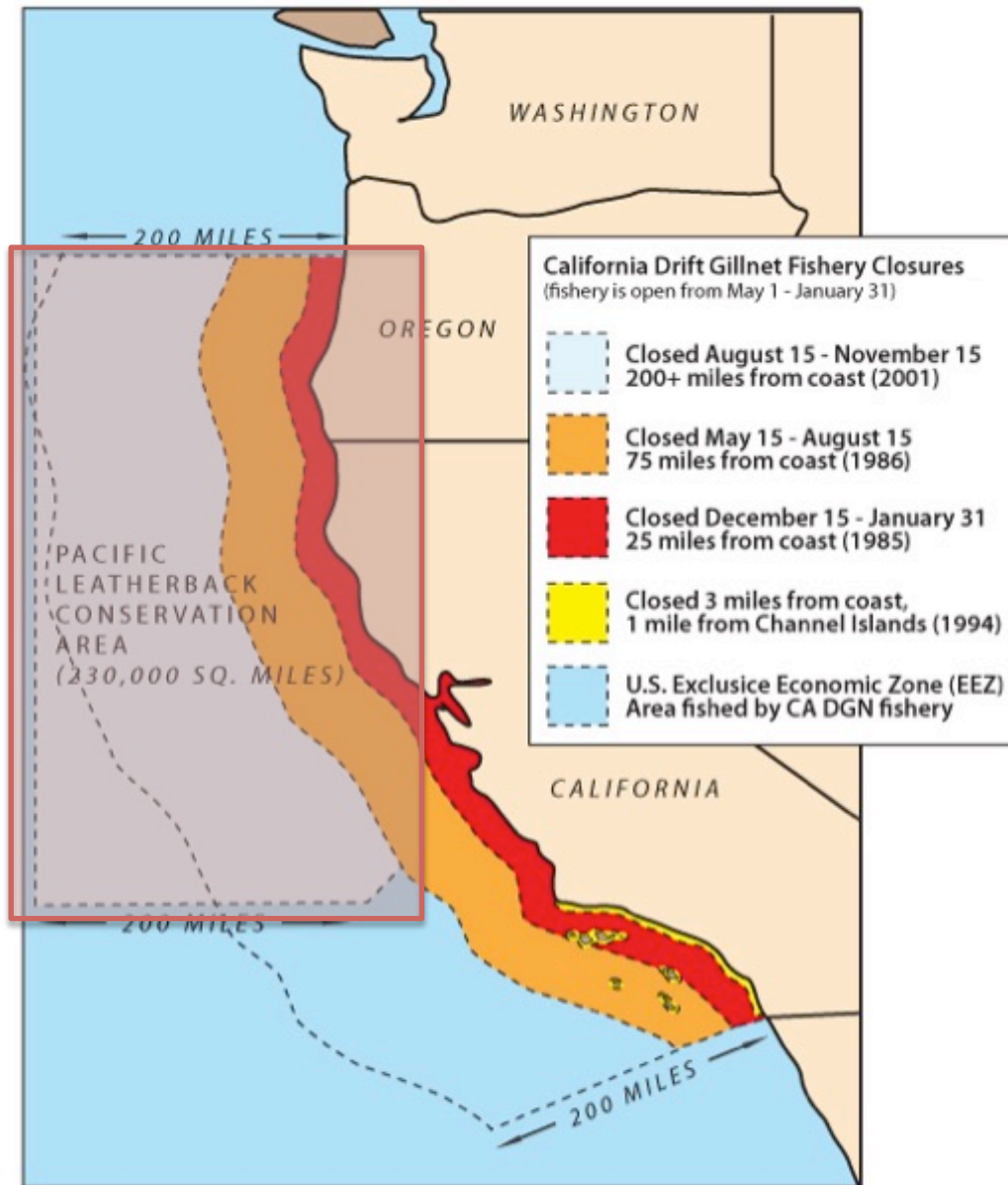
Bycatch: Leatherback sea turtles



Large seasonal closure put into place to protect leatherbacks....
....leatherback bycatch dropped to **zero** since closure but large **economic cost**

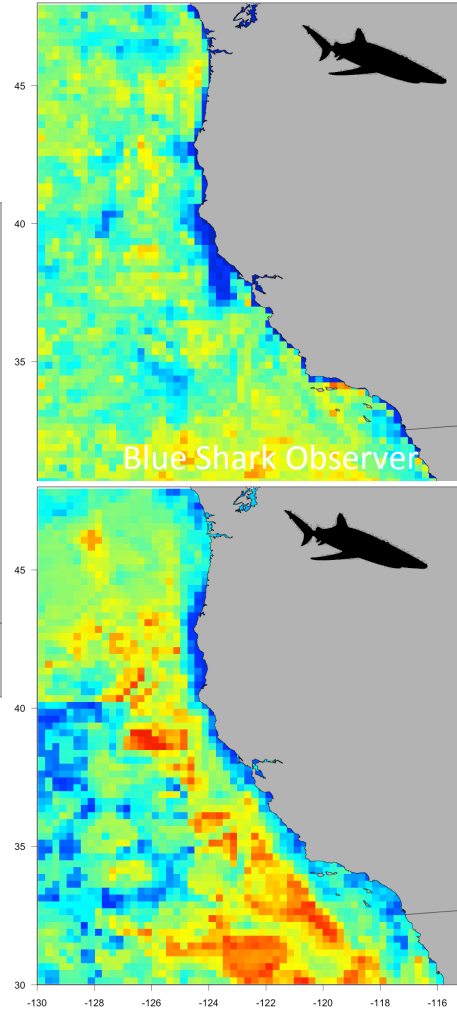
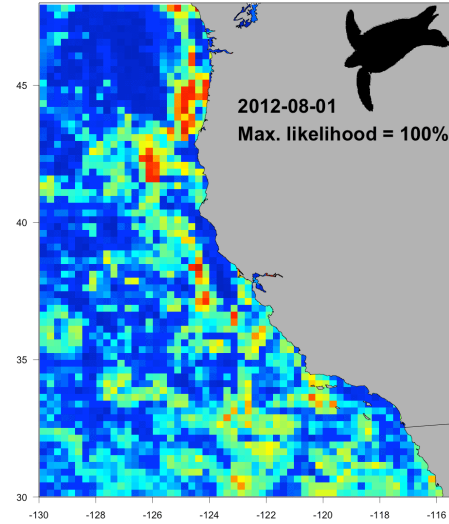
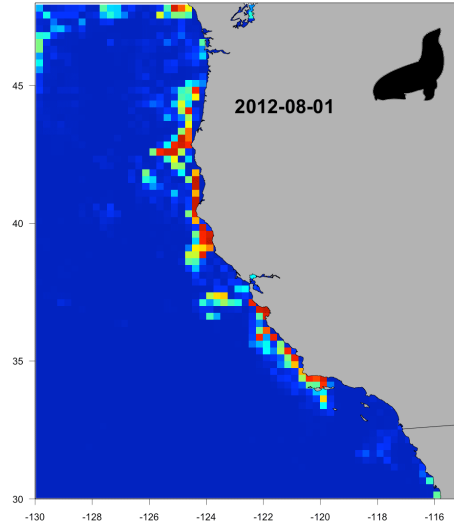
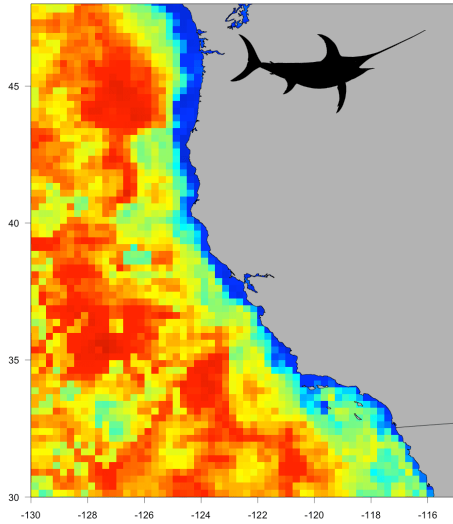
Drift Gillnet Dynamic Management

DYNAMIC MANAGEMENT:
Case Study

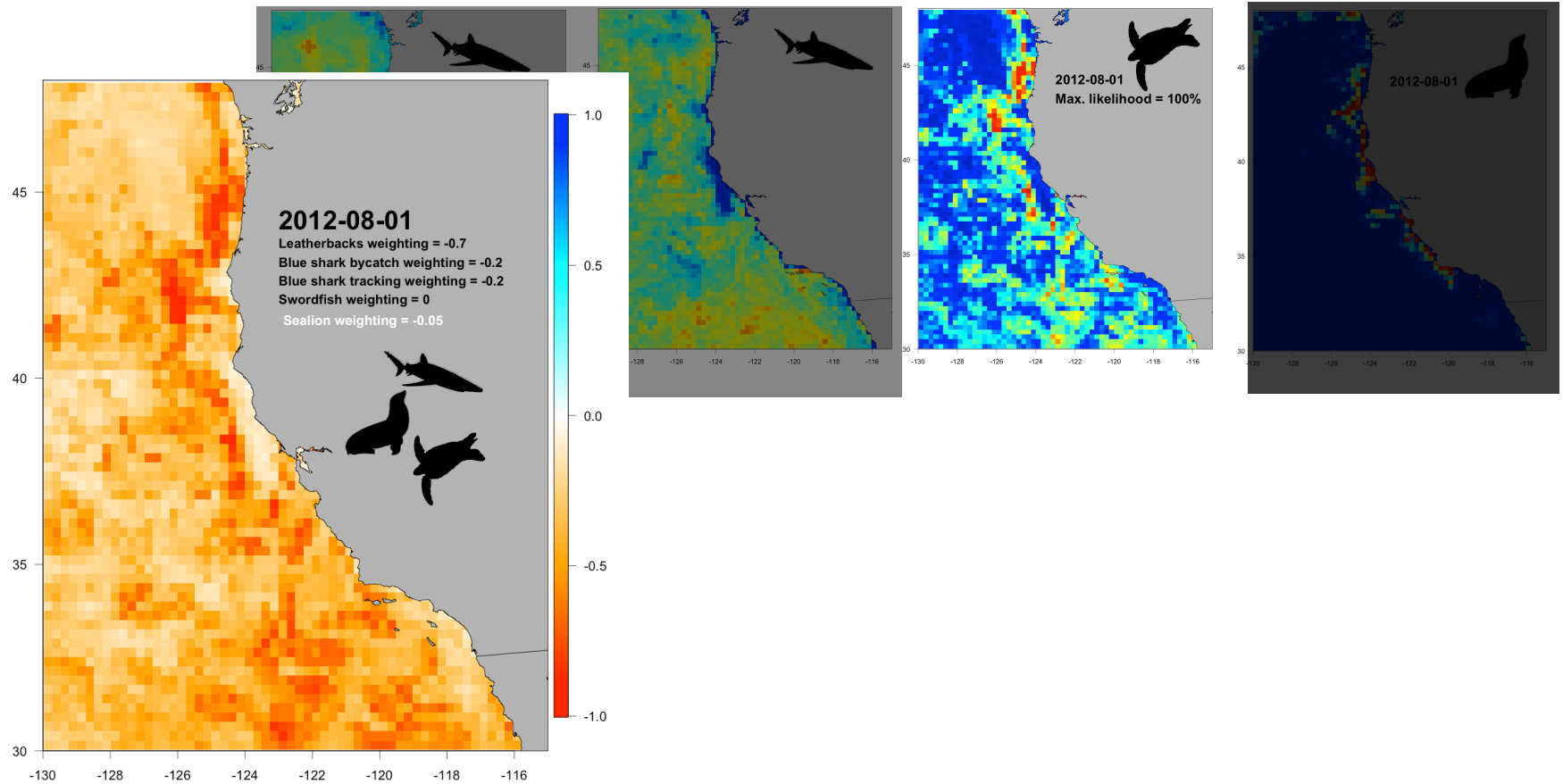


Satellite tracks from Benson et al 2011 | *Ecosphere*

Drift Gillnet Dynamic Management

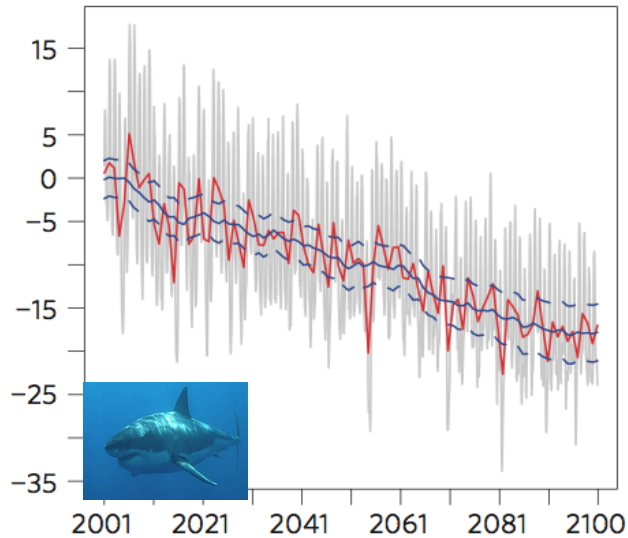


Swordfish Fishery Bycatch Predictions

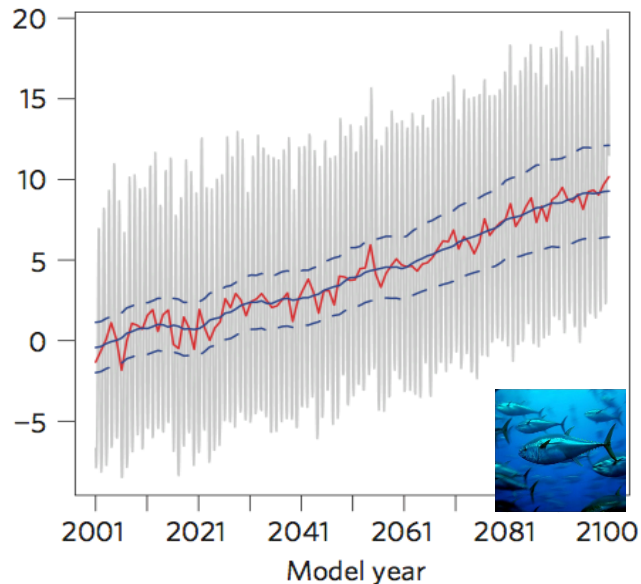


DOM: Climate Scale

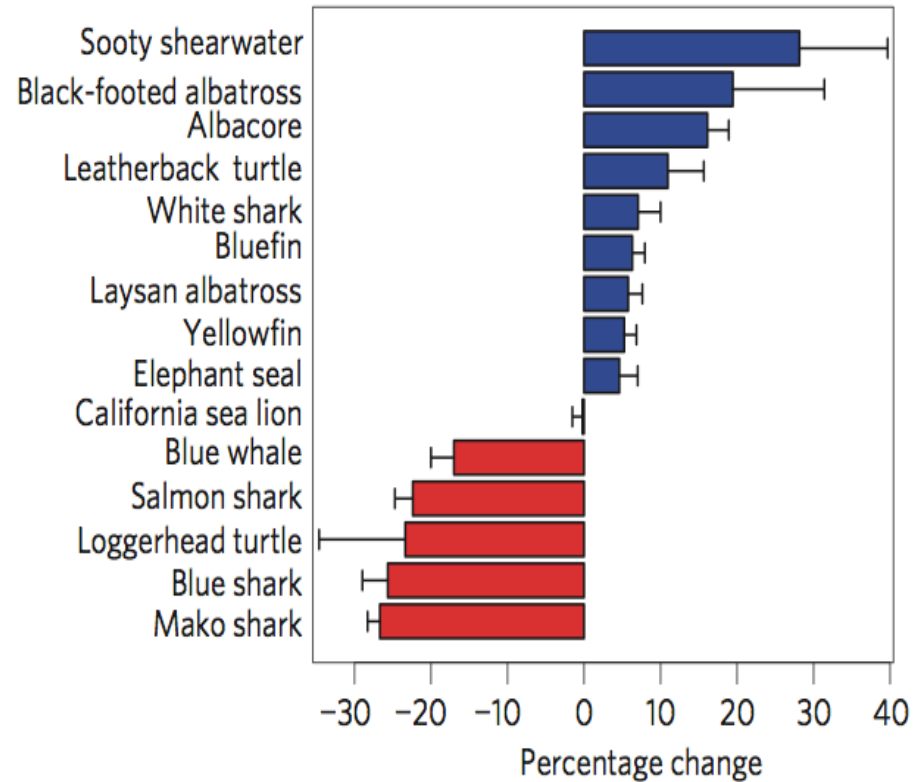
Shark guild mean core habitat area



Tuna guild mean core habitat area



Habitat change (2100-2001)



Hazen et al. 2012 *Nature Climate Change*

Dynamic Management WORKS

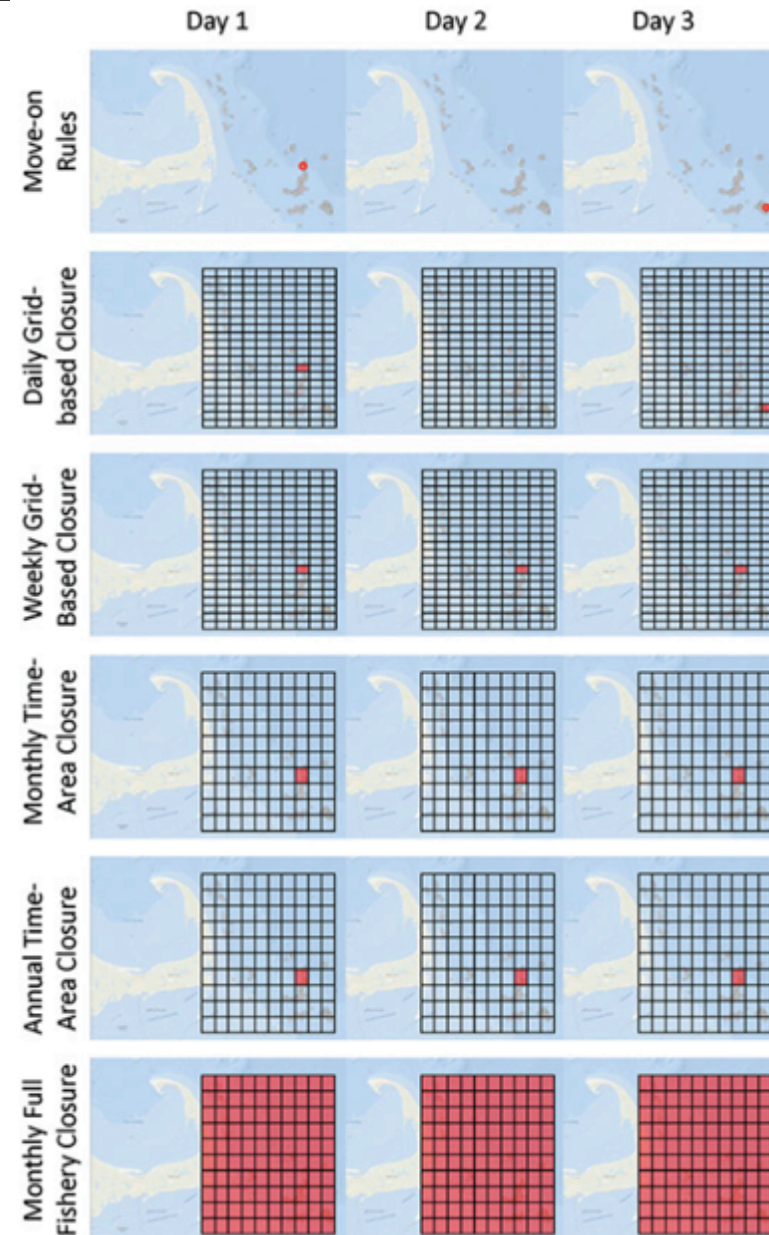
DYNAMIC MANAGEMENT:
Examples

Efficiency of Dynamic Mgmt:

1. Decreased the area managed
2. Maintained bycatch reduction
3. Maintained target catch

Can result in:

- Easier political sell
- Reduced conflicts
- Balance of ecological and economic objectives



Dynamic ocean management increases the efficiency and efficacy of fisheries management

Daniel C. Dunn^{a,1}, Sara M. Maxwell^b, Andre M. Boustany^a, and Patrick N. Halpin^a

^aMarine Geospatial Ecology Lab, Nicholas School of the Environment, Duke University, Durham, NC 27708; and ^bDepartment of Biological Sciences, Old Dominion University, Norfolk, VA 23529

Edited by James A. Estes, University of California, Santa Cruz, CA, and approved November 24, 2015 (received for review July 24, 2015)

In response to the inherent dynamic nature of the oceans and increase management efficiency across both ecological and continuing difficulty in managing ecosystem impacts of fisheries, economic objectives (7, 8), and in codifying the different ap-



Status of Dynamic Ocean Management

- Science case well developed
- Numerous management case studies at various levels of complexity
- Gaining traction among managers globally and in the US
- Next Steps: Legal and policy analysis
- Next Steps: New science to policy case studies

Typology of Dynamic Management

DYNAMIC MANAGEMENT:
Examples

