

Jellyfish and Fisheries: *Risks, Trade-offs and Adaptations*

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Jellyfish and Fisheries Management

- Things we are getting better at...
 - Jellyfish measuring, tracking, identifying
 - Basic jellyfish ecology (feeding, reproduction)
 - Modeling and forecasting jellyfish biomass and movements
 - Identifying and quantifying problems (and benefits)
- Still having difficulty putting jellyfish into management framework for fisheries (or coastal water quality)

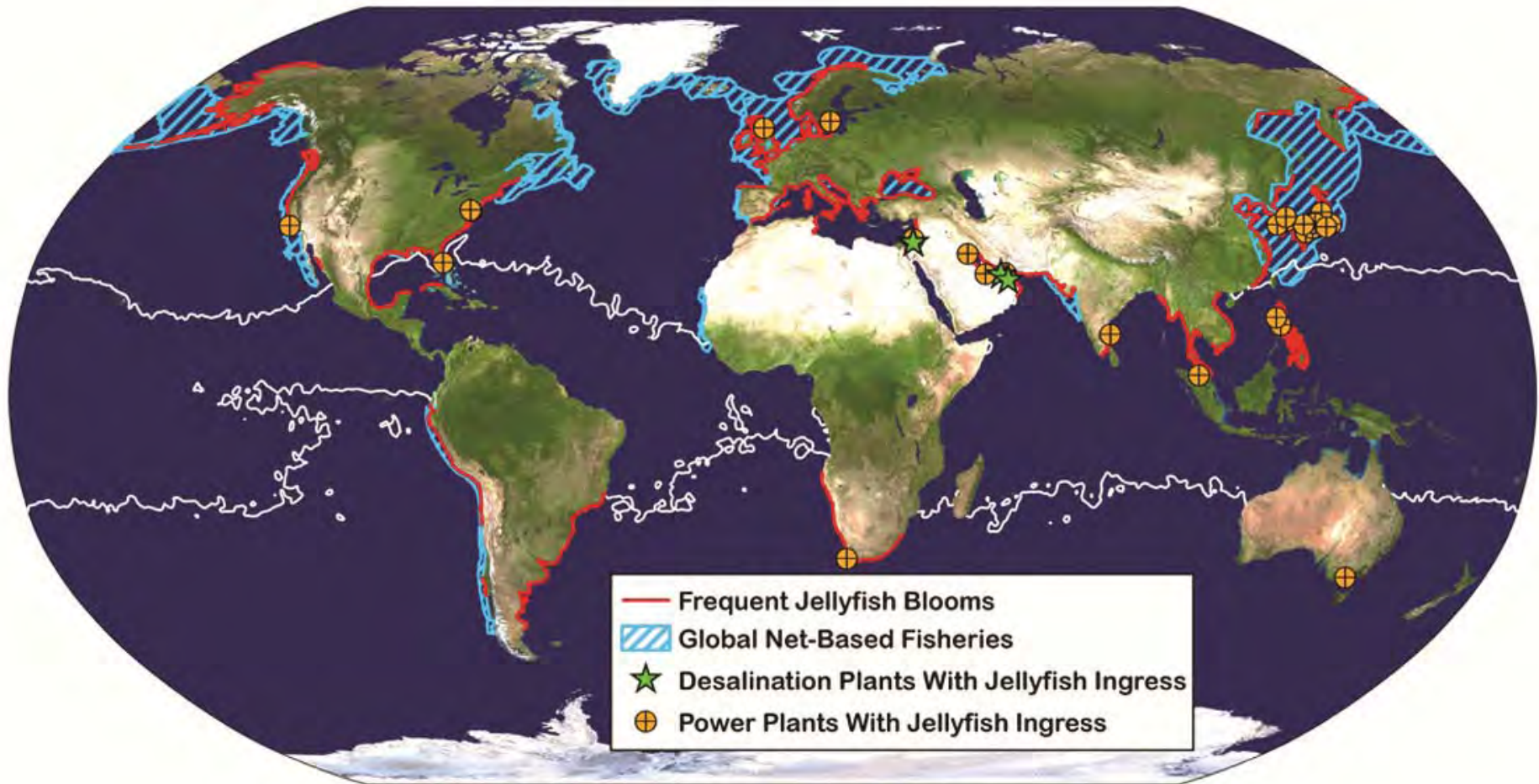
What are we *really* managing in fisheries management?

- Ecosystem Approach to Management (ecosystem management = fishery management)

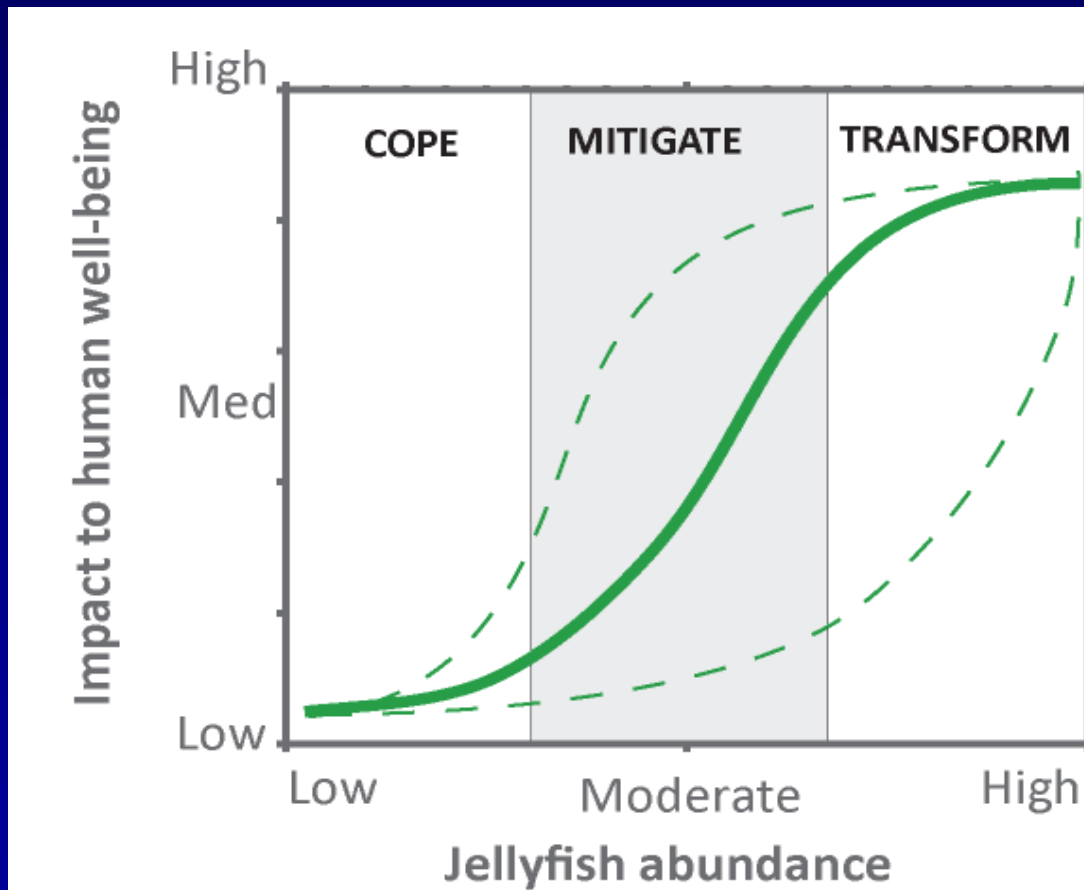
- Ecosystem =
 - fish
 - fish food
 - things that eat fish
 - habitat
 - 'natural' variability



Jellyfish Blooms and Human Enterprise



Where do Thresholds Exist?



- Do nothing because cost exceeds value of losses.
- Do something because value of losses exceeds mitigation.
- 'Gone too far'

Acceptable or Unacceptable Risks?

Injuries to fishers: Risk thresholds very low



“Giant Jellyfish Sinks Boat”

National Geographic

Gear fouling

Crambionella orsini caught by fishing trawler
Gulf of Oman

- Gear damage or loss
- Loss or reduction of harvest
- Increased effort
- Lost value of harvest





Photos: S

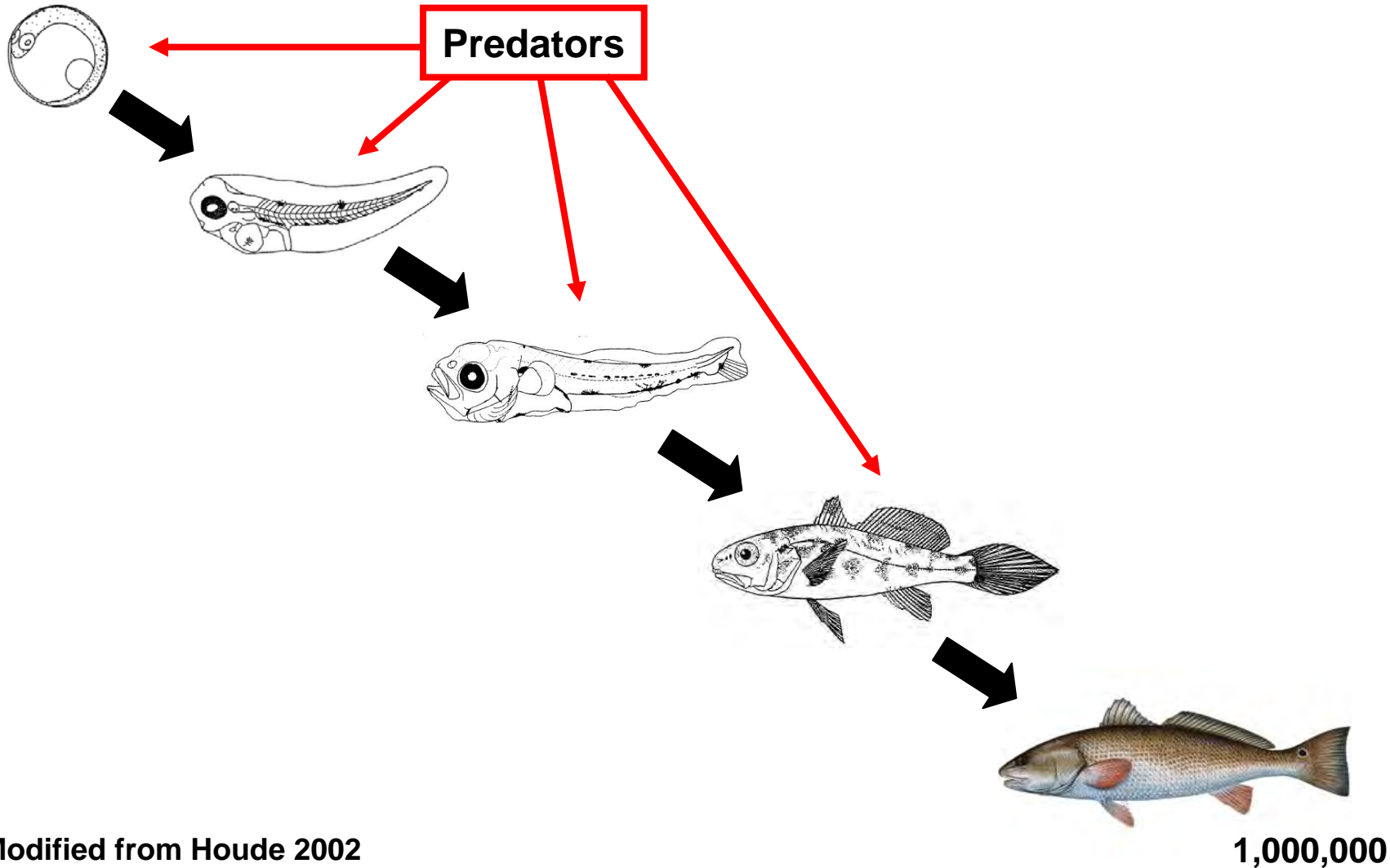
Decisions for Mitigating Efforts

Trade-offs

- Countermeasures cost ¥ ! But can be effective when compared to economic losses to fishery

Egg/larval Mortality: Risks remain unknown?

100,000,000,000,000



Modified from Houde 2002

Adult fish mortality



Adult fish mortality

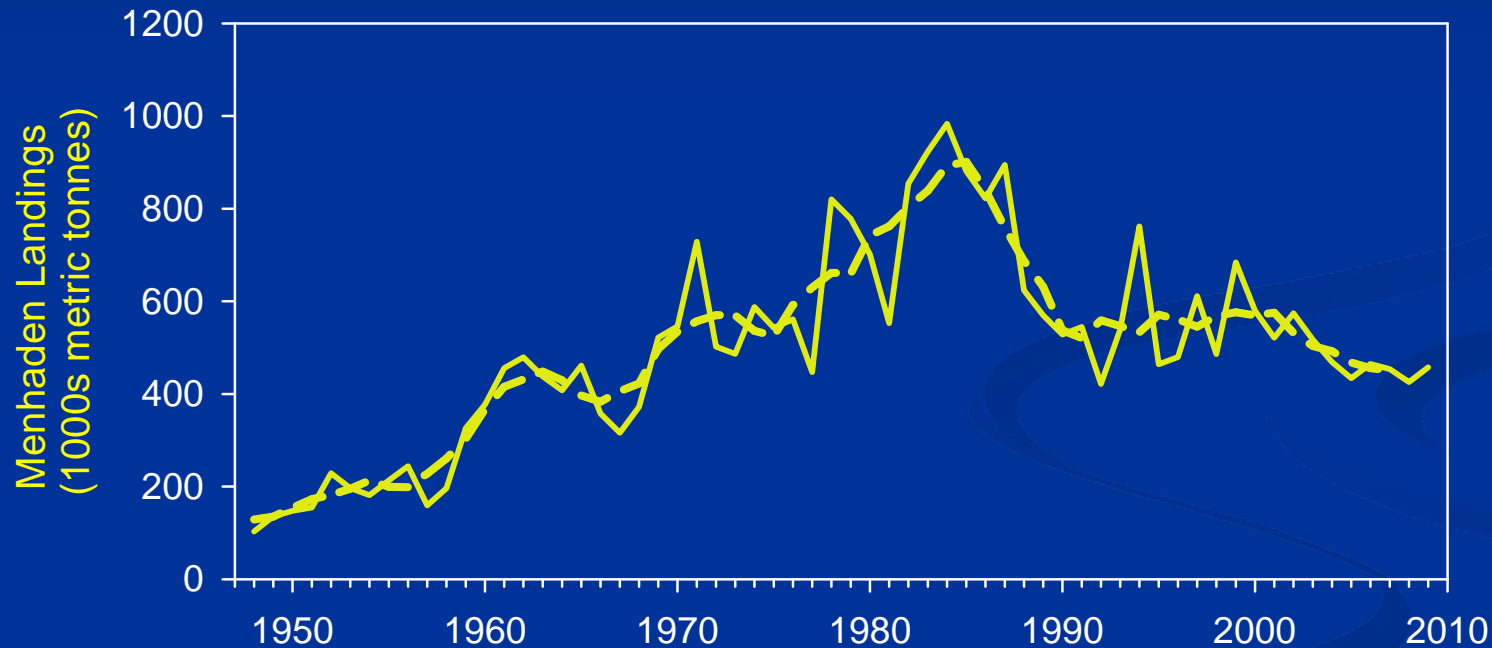


Ecosystem transformations



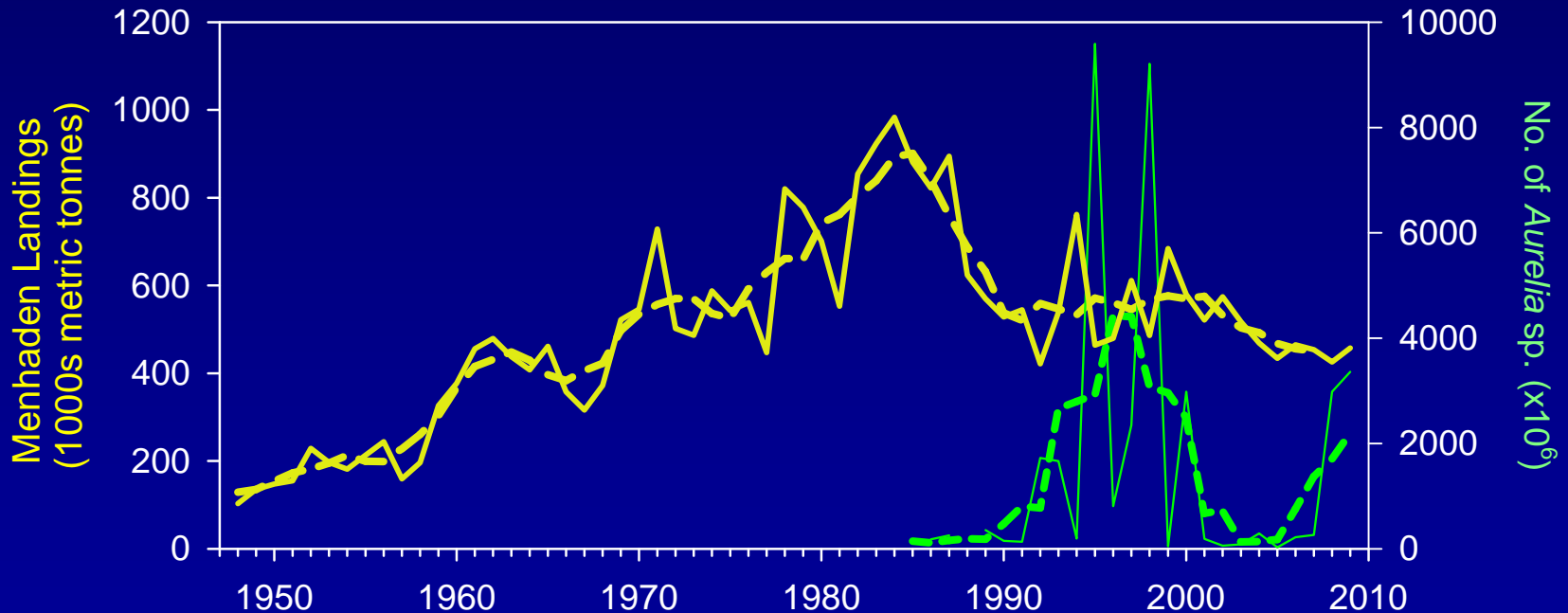
Gulf Menhaden Fishery

Annual Landings and 5-yr Average 1948-2009



Gulf Menhaden and *Aurelia*

Annual Landings and 5-yr Average
1948-2009

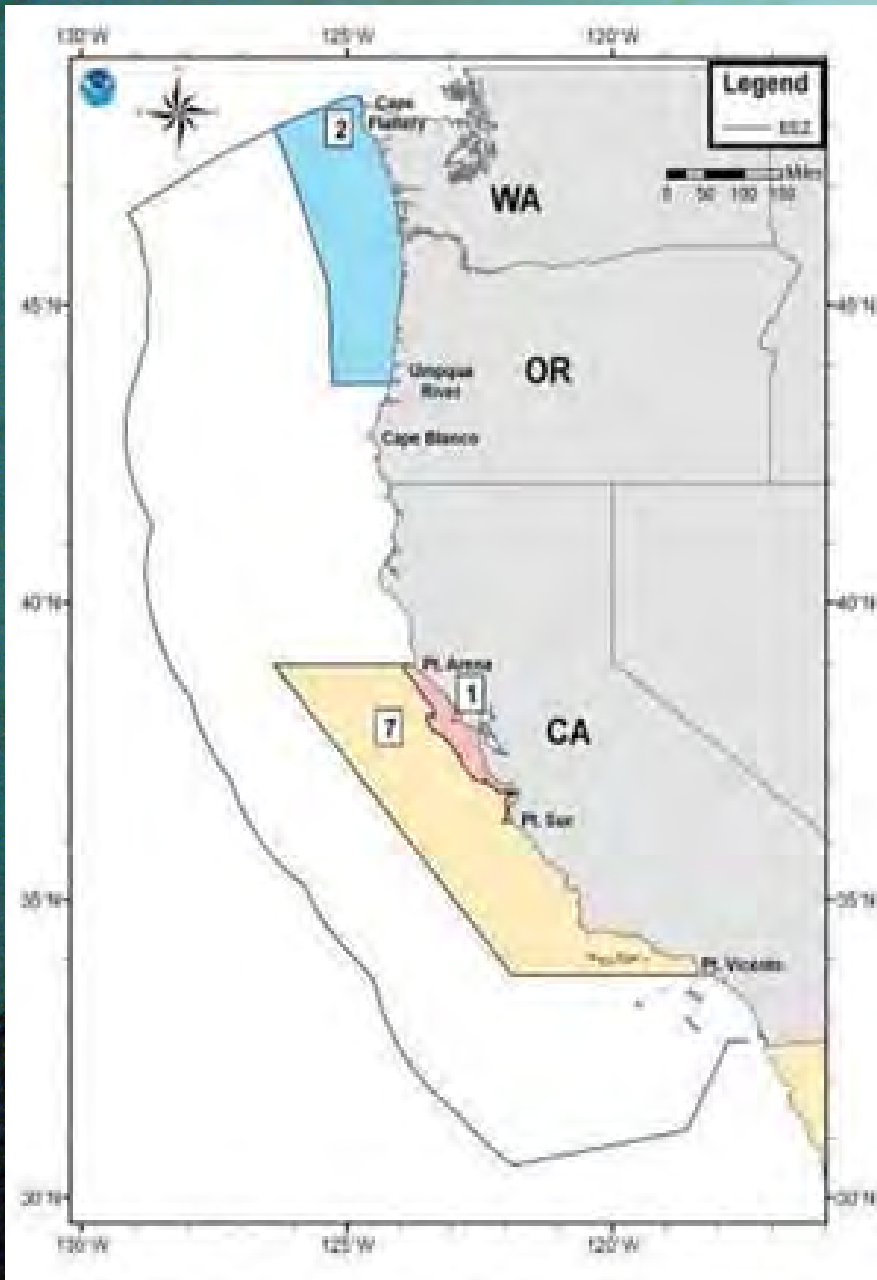


Are we willing to manage the ecosystem to transformations?

Offsets by Services Provided?

- Regulating: nutrient cycling, carbon flux, trophic mediation
- Supporting: refugia, biodiversity of associates
- Provisioning: jellyfish fisheries; biotechnology
- Social/cultural: aquaria, tourism

Jellyfish as critical habitat



Chrysaora fuscescens
Monterey Bay, CA

D. Wrobel

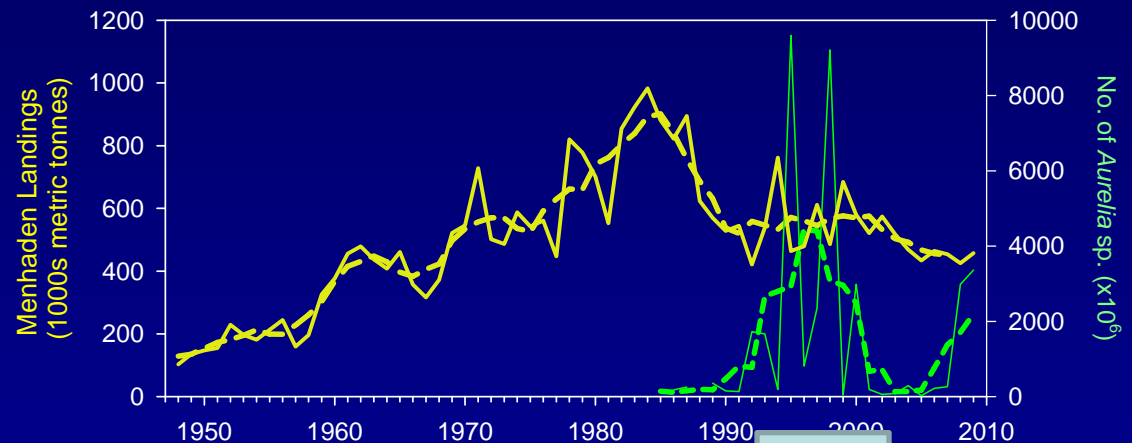
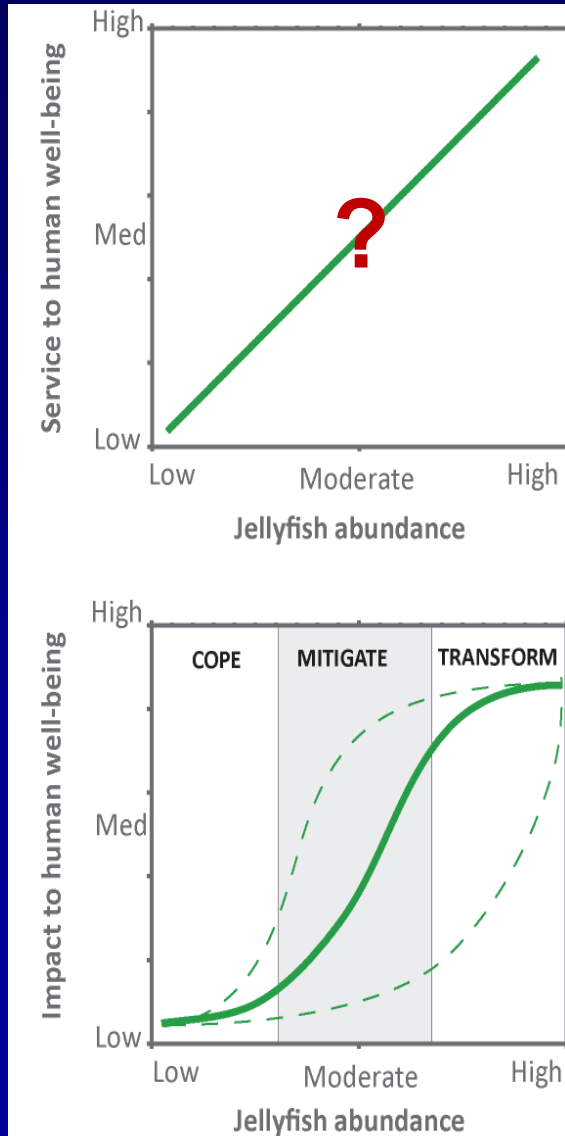


US jellyfish fishery



Photos by Mary Landers/Savannah Morning News

Impacts Balanced Against Services



Decisions for Mitigating Efforts

Trade-offs

- Monitoring costs ¥, too! But can provide valuable offset when applying countermeasures over short-term and long-term variability

Decisions for Mitigating Efforts

A photograph of a fishing boat deck. A large, dark net is spread out on the deck, filled with numerous jellyfish. Several crew members wearing blue hard hats and yellow or purple jackets are visible on the right side of the deck, working with the net. In the background, another fishing boat is visible on the water. The sky is overcast.

Trade-offs

- When is it necessary to alter fishery management (e.g., harvest reductions) to avoid transformation?
 - Very costly in short-term, but savings realized over time.

What is the framework for management that includes jellyfish?

1. Quantifying risks balanced against benefits requires more socio-economic data to identify *critical thresholds* of impacts.
2. Documenting and predicting when jellyfish exceed thresholds (unacceptable risk) requires sustained data gathering.
3. More than just countermeasures...ecosystem management needs specific targets that are *meaningful* and *attainable* if jellyfish are sentinels of transformation.

Thank you!

Photo and video credits:

Reiji Masuda

Jack Costello

Bill Hamner

Rob Condon

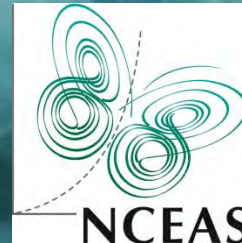
Reza Daryanabard

Wan Duk Yoon

Alenka Malej

Dan Martin

Mairi Miller



Aurelia sp.
Saanich Inlet, WA

W. Hamner