Risk assessment and application of indicators to decision making

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Overview of presentation

1. Risk assessment and contextual indicators

2. Near-term context and decision making

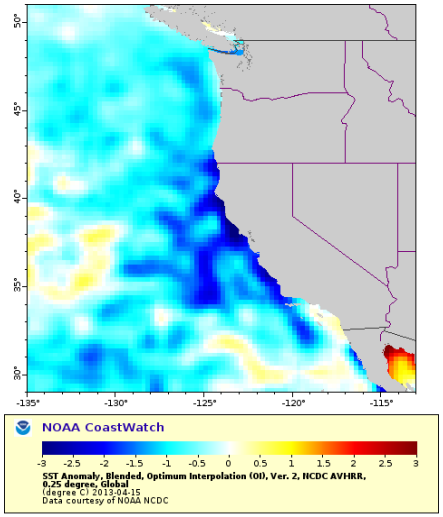
   Assessing multiple risks in a dynamic ocean

3. Long-term planning for climate change

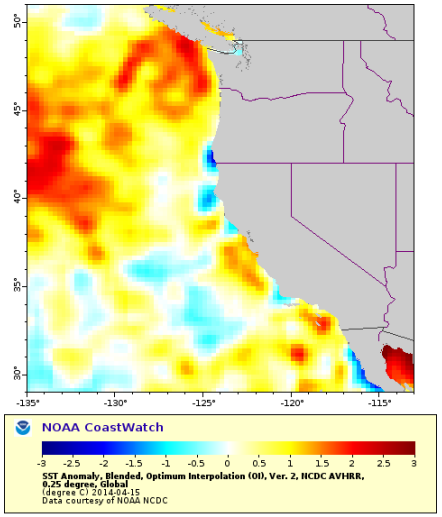
   Vulnerability of coastal pelagic fisheries

Contextual indicators

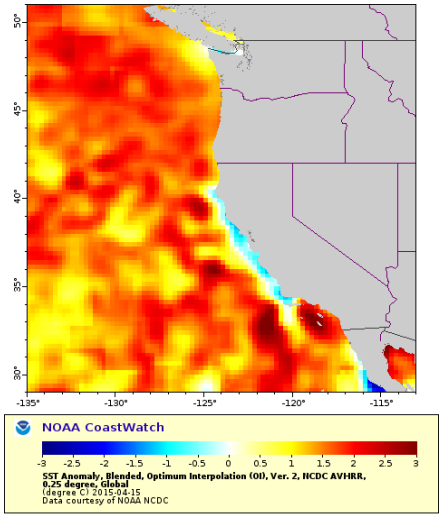
Example: SST provides context for sardine management

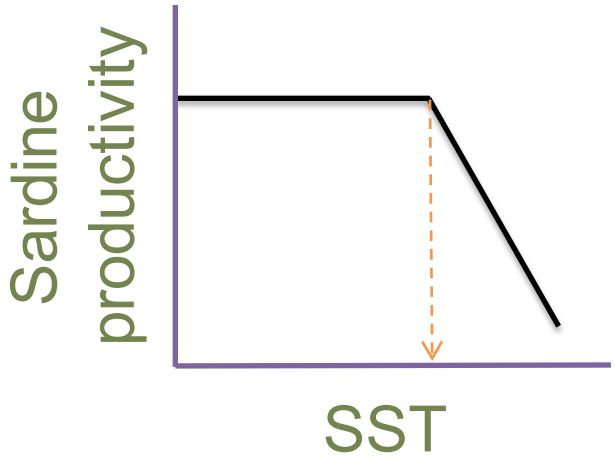


vs.



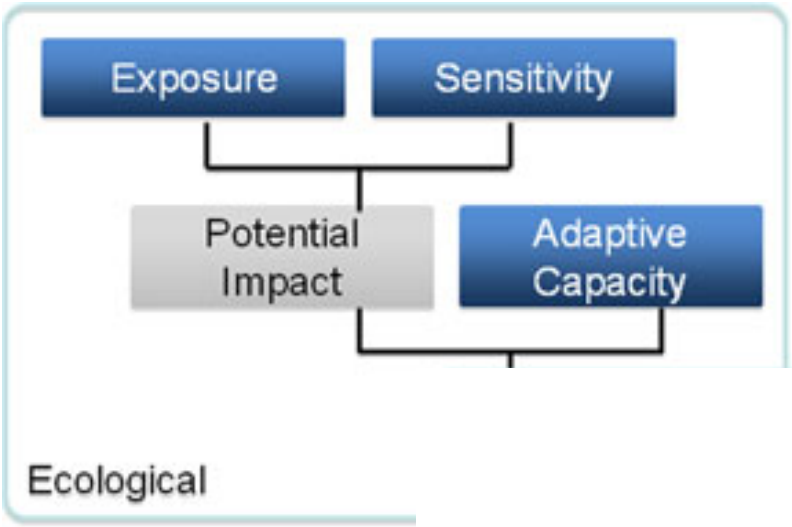
vs.





Risk and vulnerability assessments

the chance, within a timeframe, of an adverse event with specific consequences



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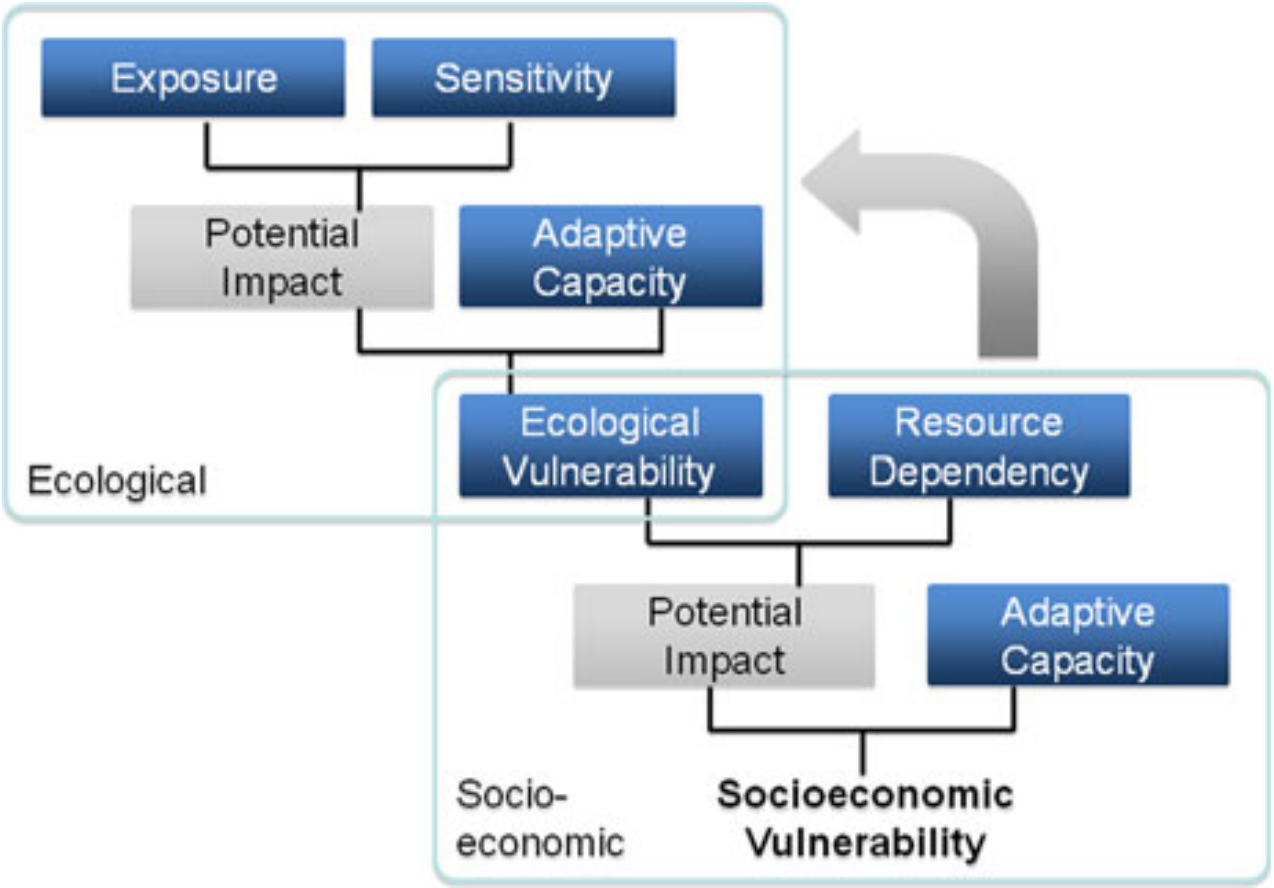
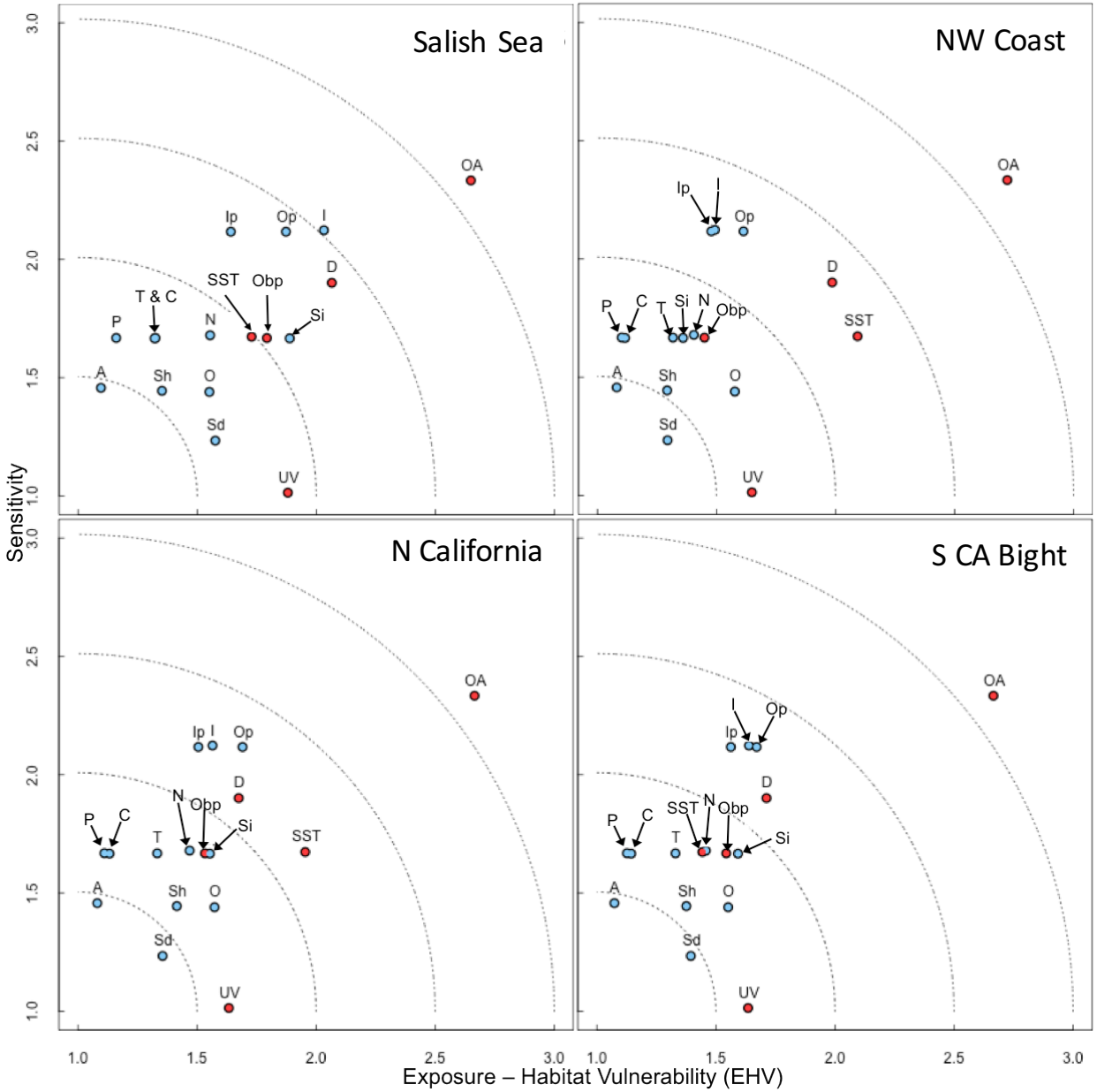


English Sole Risk

Correigh Greene et al. *in prep*



Abbr.	Stressor
A	Aquaculture
C	Coastal engineering
D	Atmospheric deposition
I	Invasive species
Ip	Inorganic pollution
N	Nutrient input
O	Offshore oil activities
OA	Ocean acidification
Obp	Ocean-based pollution
Op	Organic pollution
P	Power plants
Sd	Sediment decrease
Sh	Shipping activity
Si	Sediment increase
SST	Sea surface temperature
T	Trash/Coastal waste
UV	UV radiation

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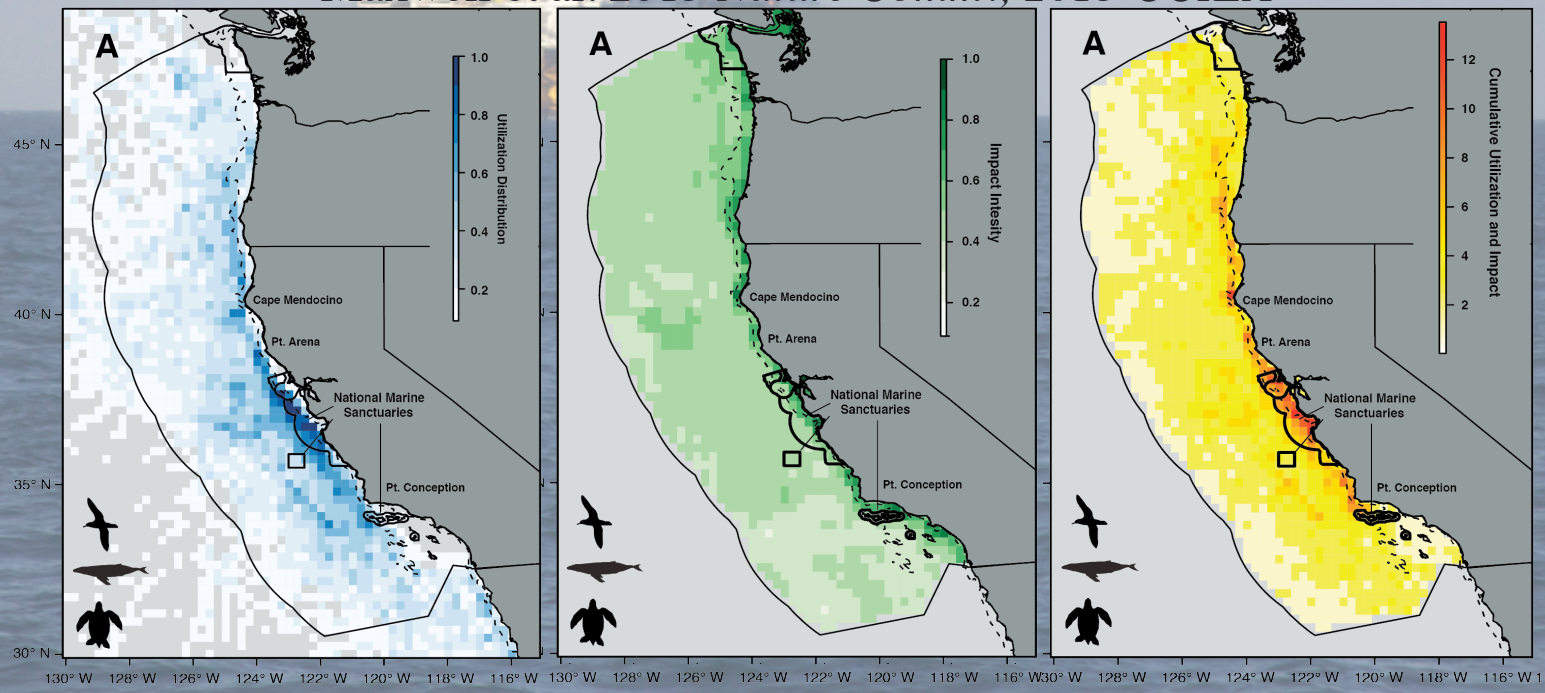
Cumulative risks

Multiple risks:

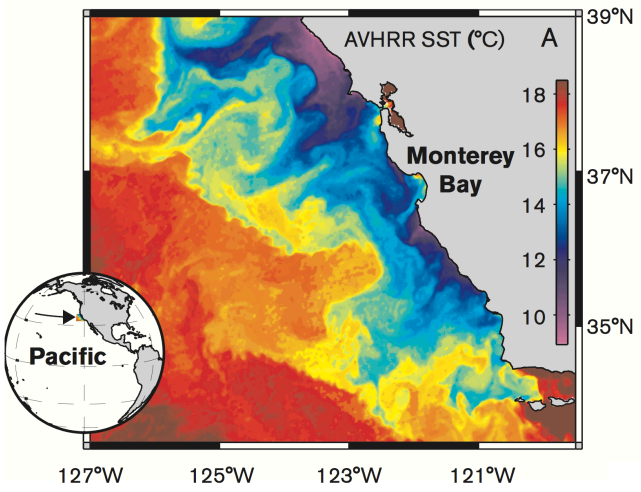
- ship strikes
- bycatch / entanglement,
- noise
- climate change

- Use satellite data to model species and risk in near real time

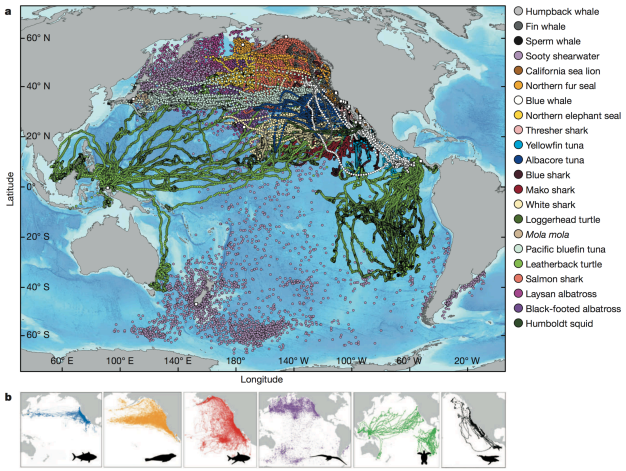
Maxwell et al. 2013 *Nature Comm.; 2013 CCIEA*



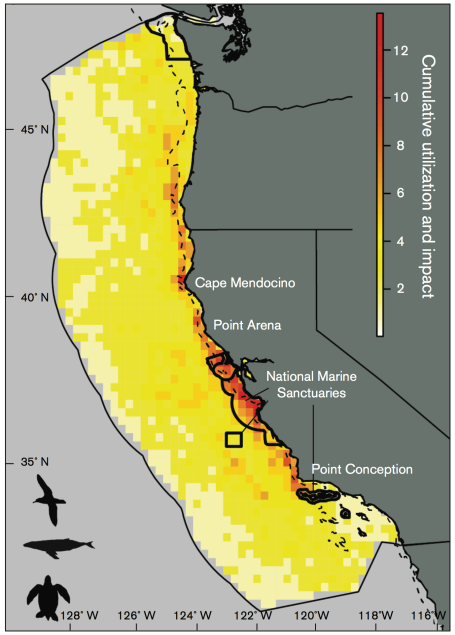
Dynamic Ocean Management



Ryan et al. 2005



Block et al. 2011

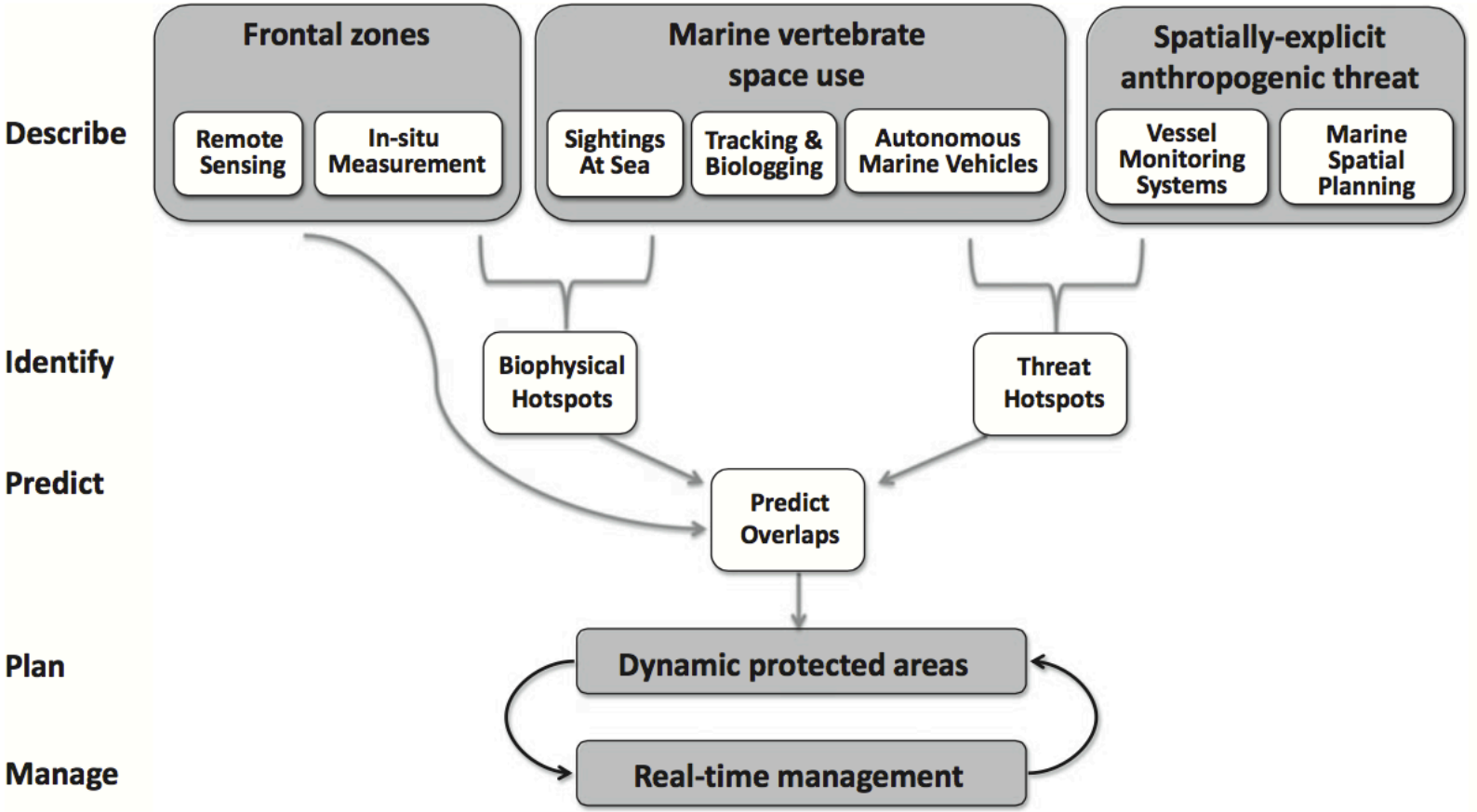


Maxwell et al. 2013

Management that changes in space and time, at scales relevant for animal movement and human use.

Hobday et al. 2014, Lewison et al. 2015, Maxwell et al. 2015

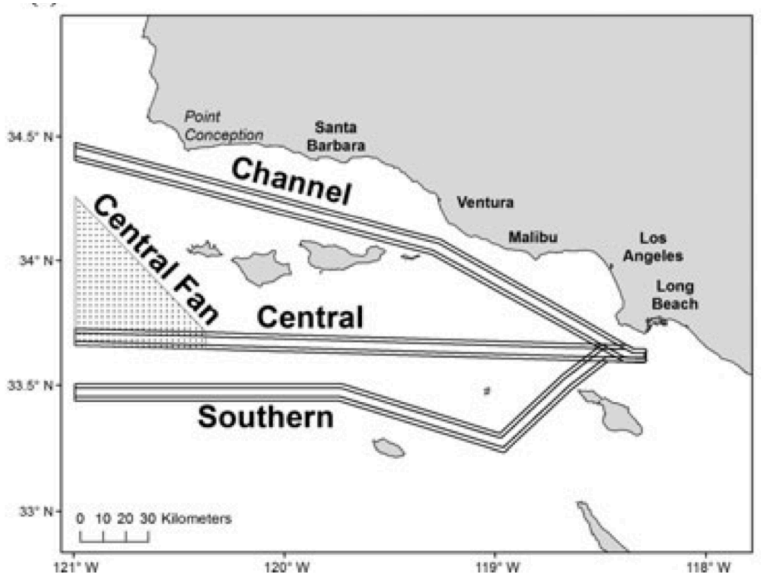
Dynamic Ocean Management



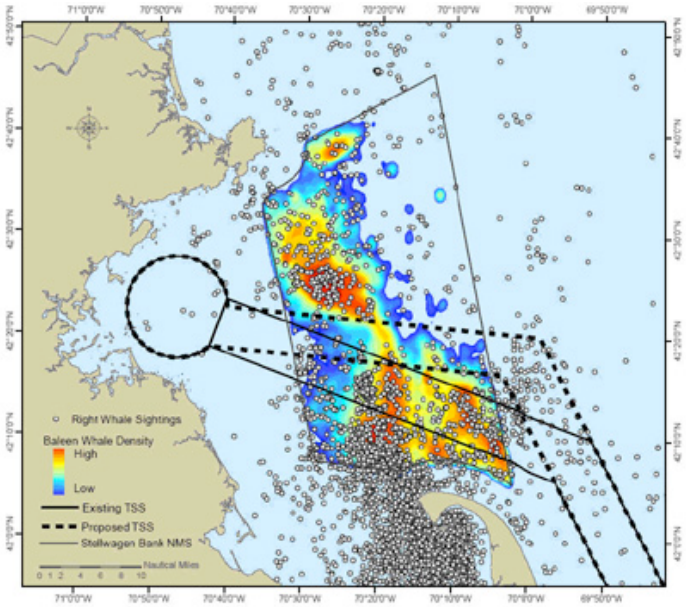
Scales et al. 2014 J Appl Ecol

WhaleWatch - Objective

- Use satellite telemetry and oceanographic data to develop habitat-based models of the probability of occurrence and densities of blue whales in the California Current System.
- This will assist management efforts to mitigate against human impacts, such as ship strikes and entanglements. Working closely with NOAA/NMFS Southwest Regional Office.

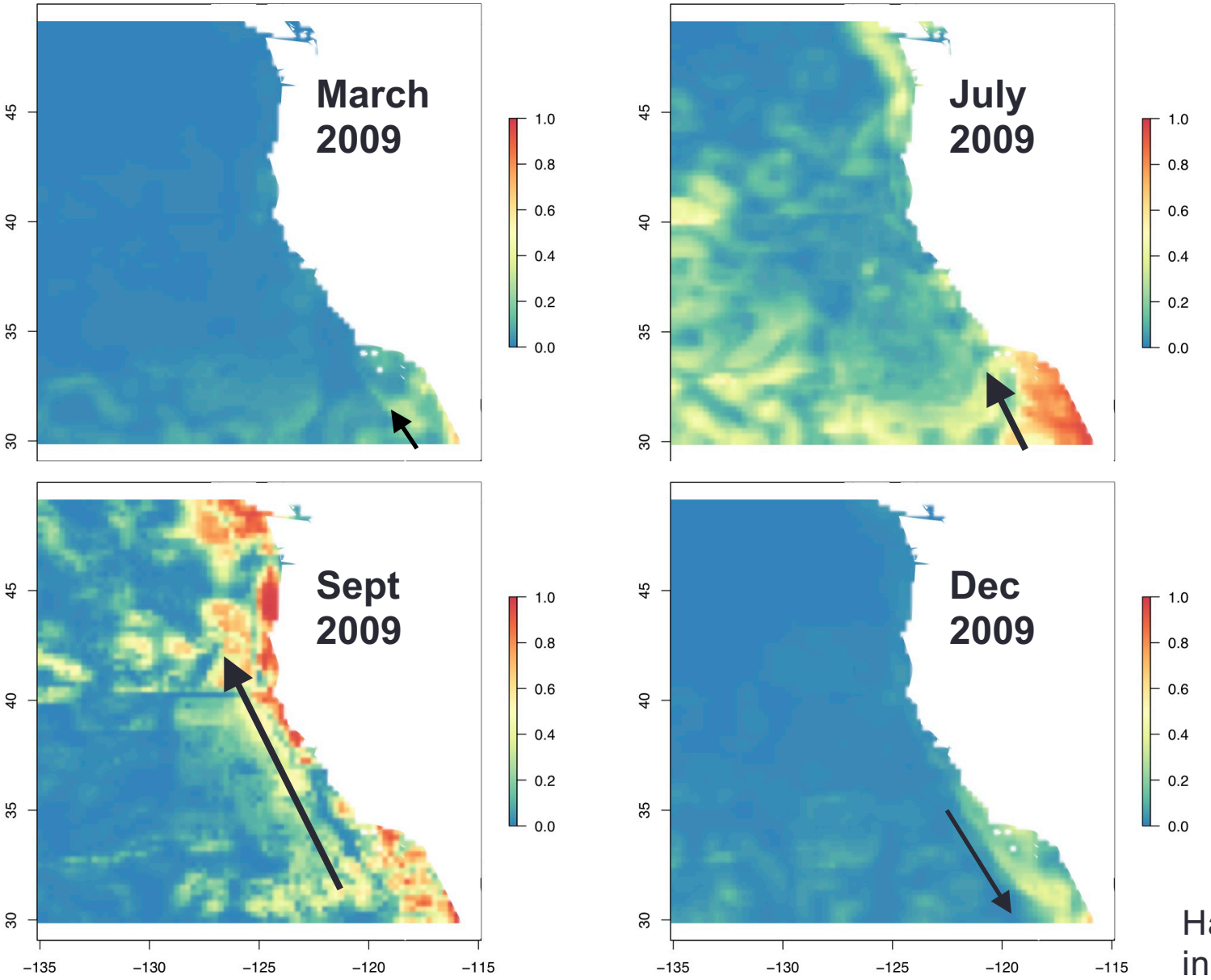


Redfern et al. 2013



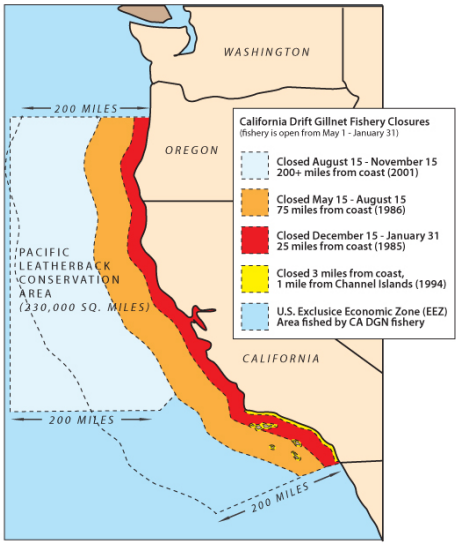
Wiley et al. 2011

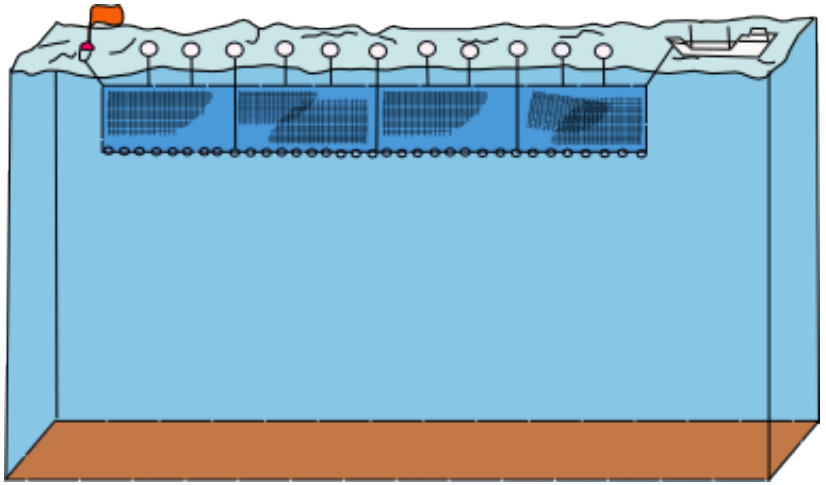
Seasonal Predictions



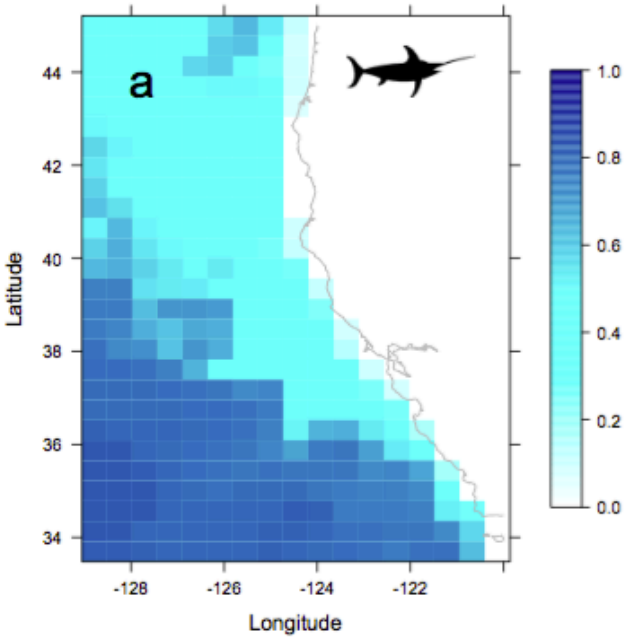
Hazen et al. in review

Fisheries applications *(in development)*

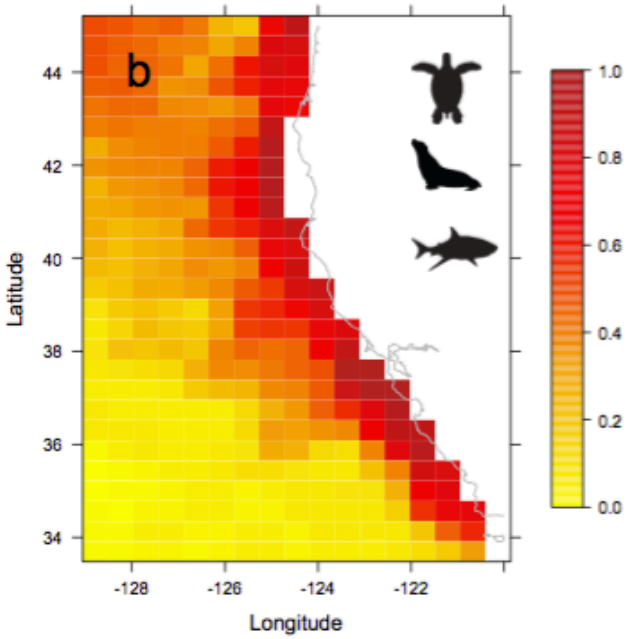




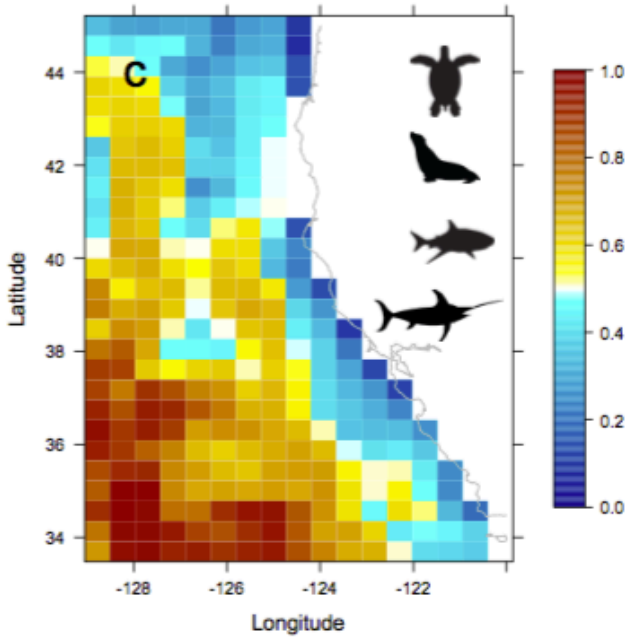
Predicted catch 2009



Predicted bycatch 2009



Ecocast 2009



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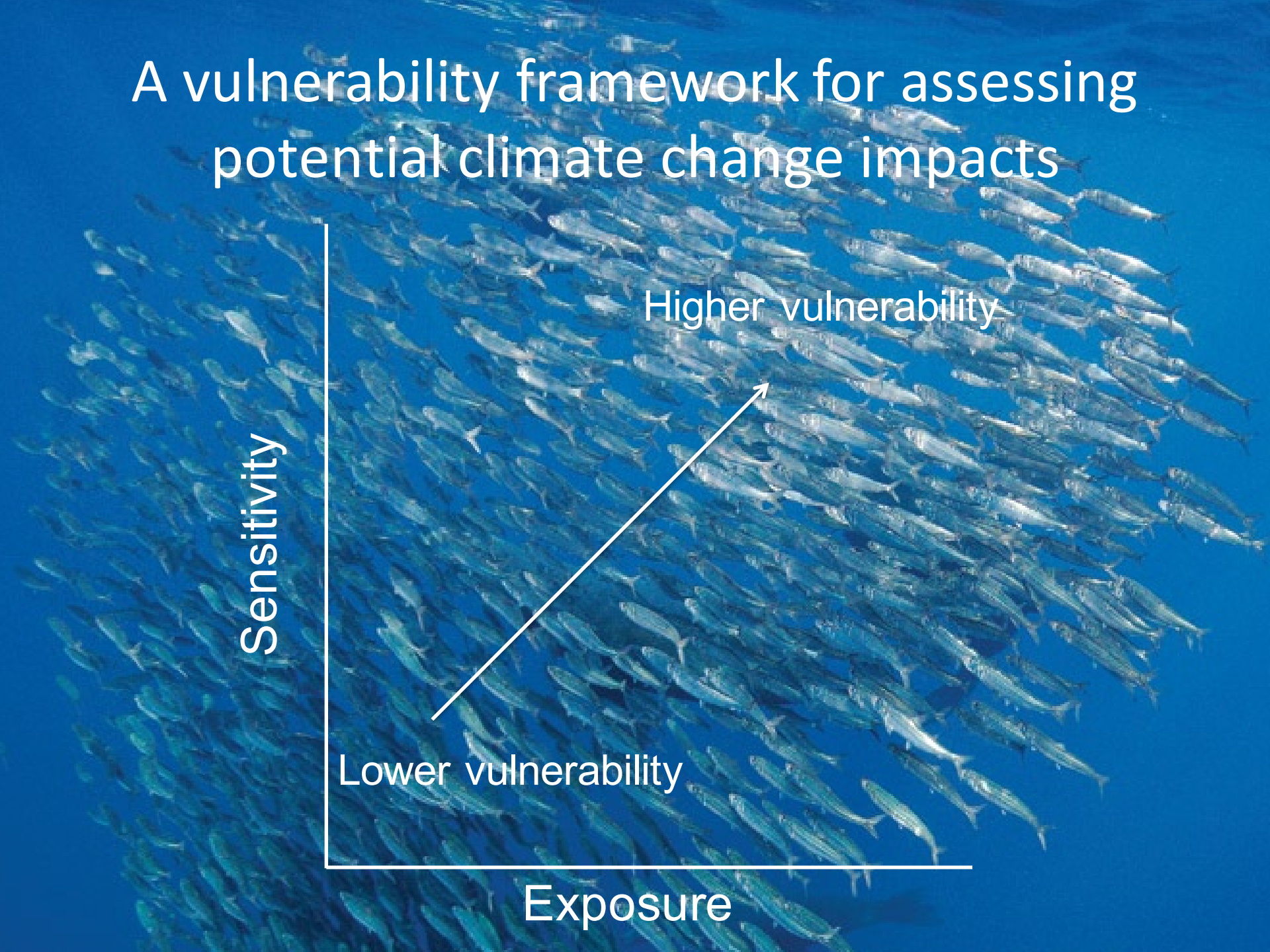
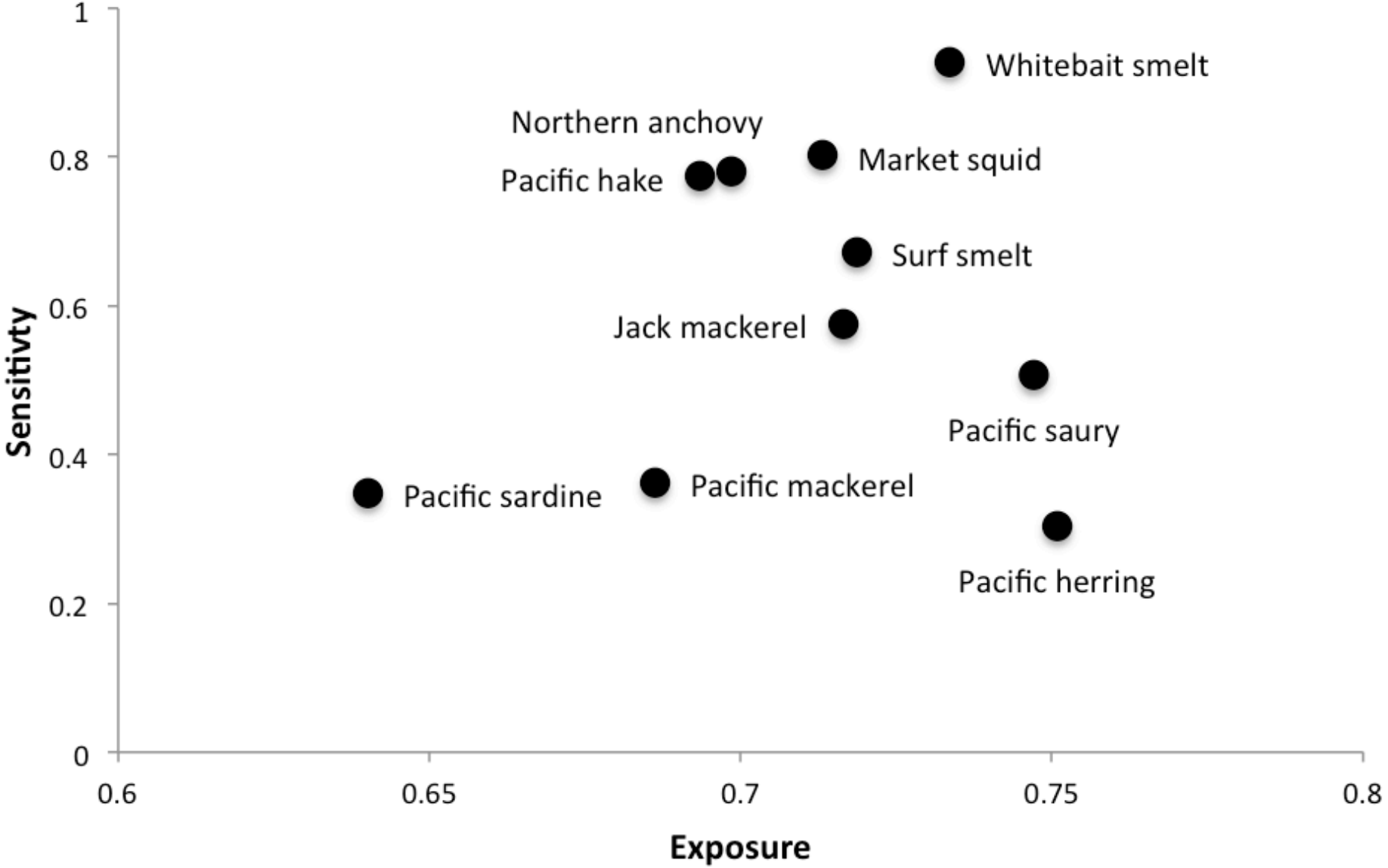
How vulnerable are marine forage species in the California Current to climate change?

Samhouri et al. 2014

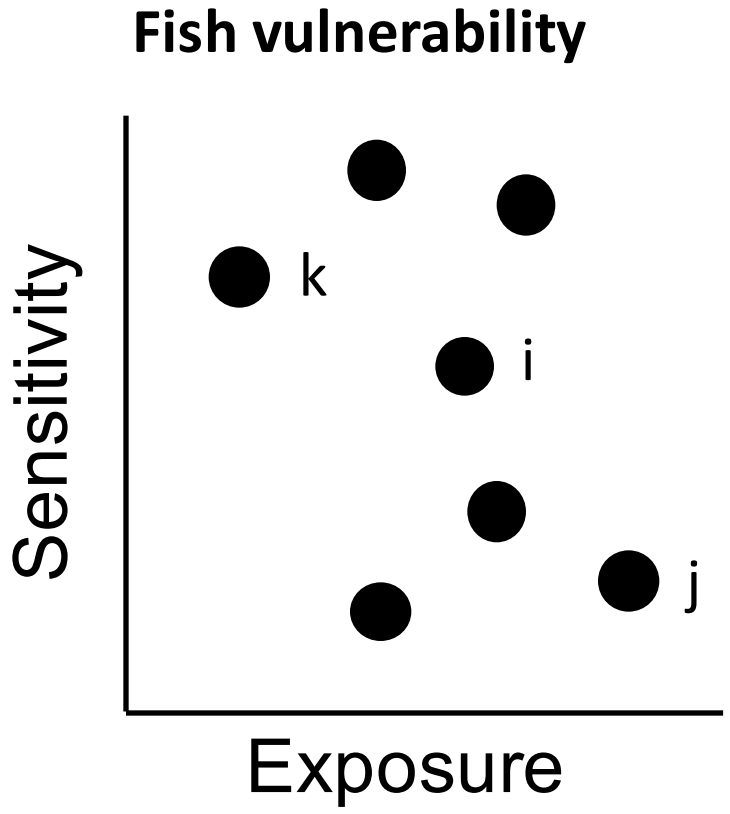
A vulnerability framework for assessing potential climate change impacts



Vulnerability to climate change for 10 forage species in the California Current



Translate ecological vulnerability to social exposure



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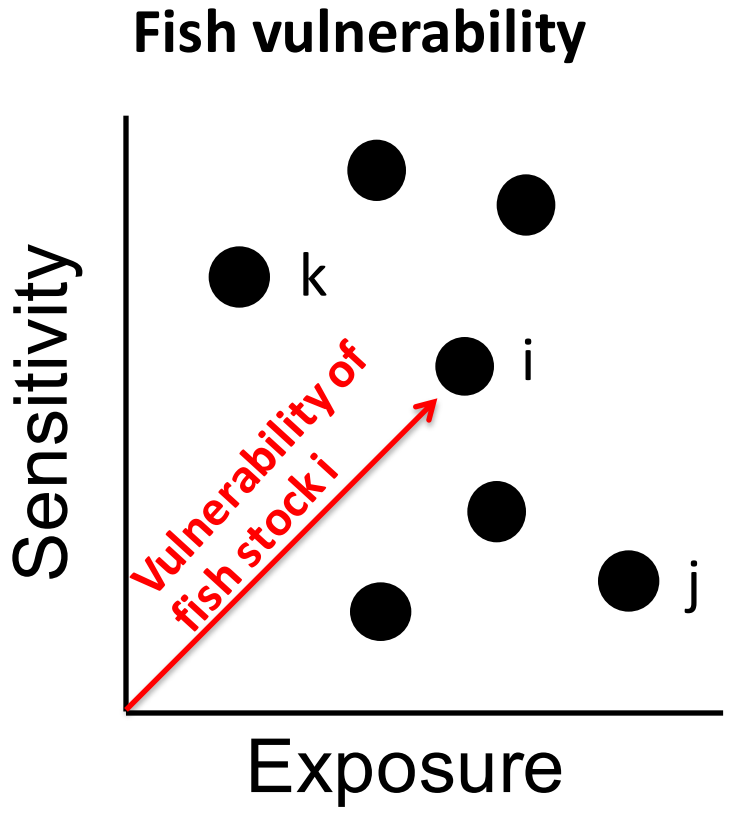
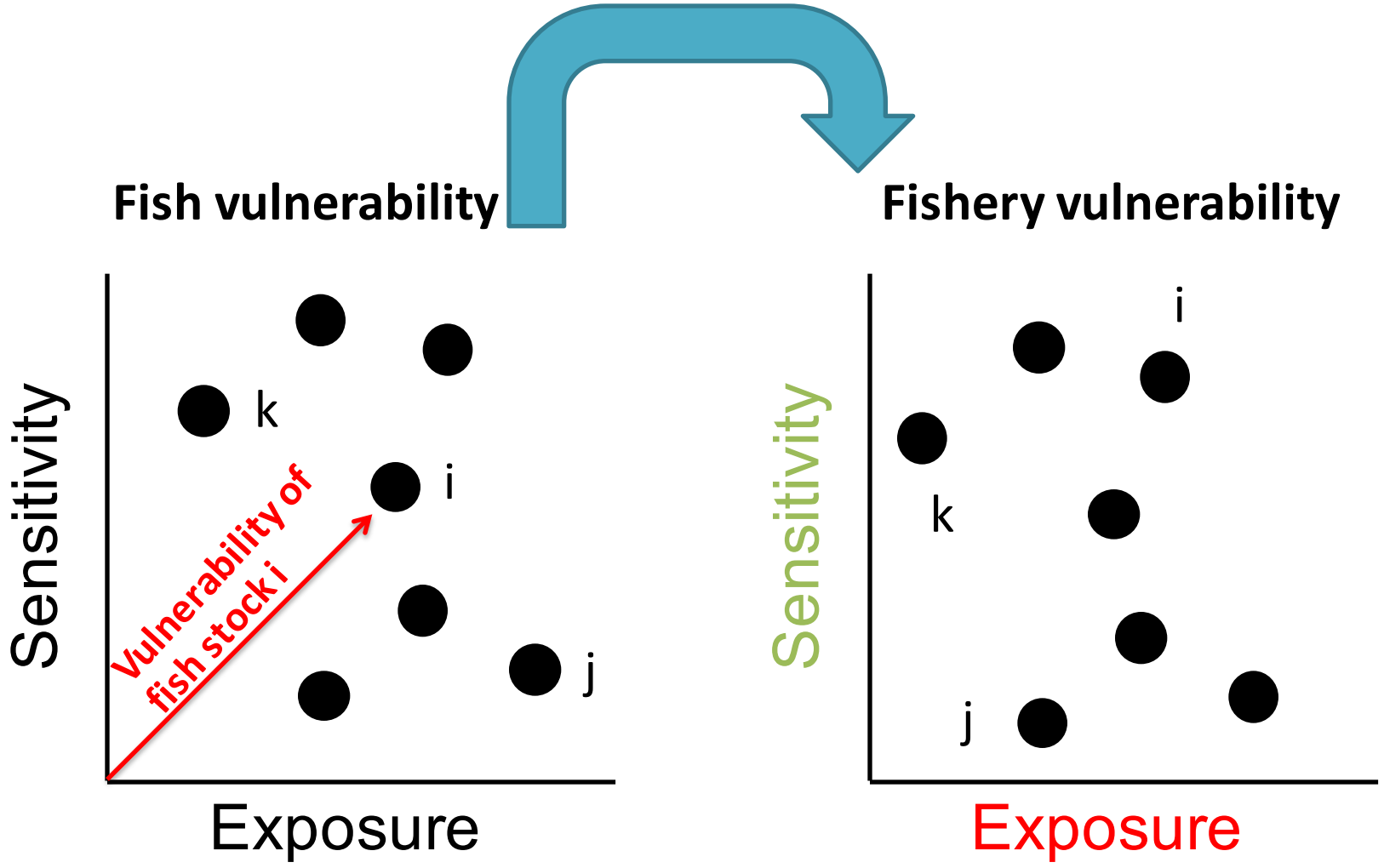
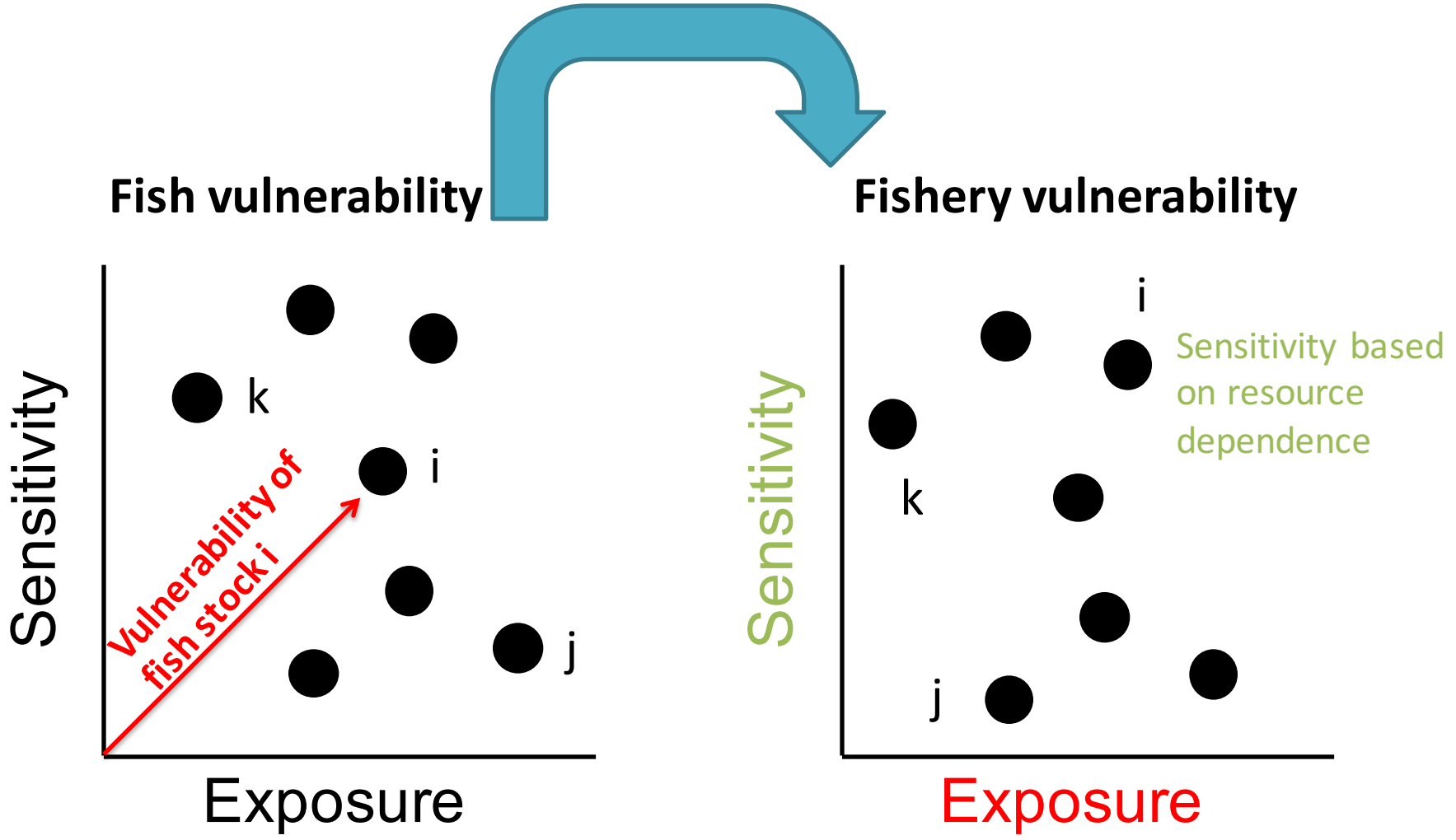


Translate ecological vulnerability to social exposure: fisheries



Translate ecological vulnerability to social exposure: fisheries



VULNERABILITY OF FORAGE FISH FISHERIES TO CLIMATE CHANGE

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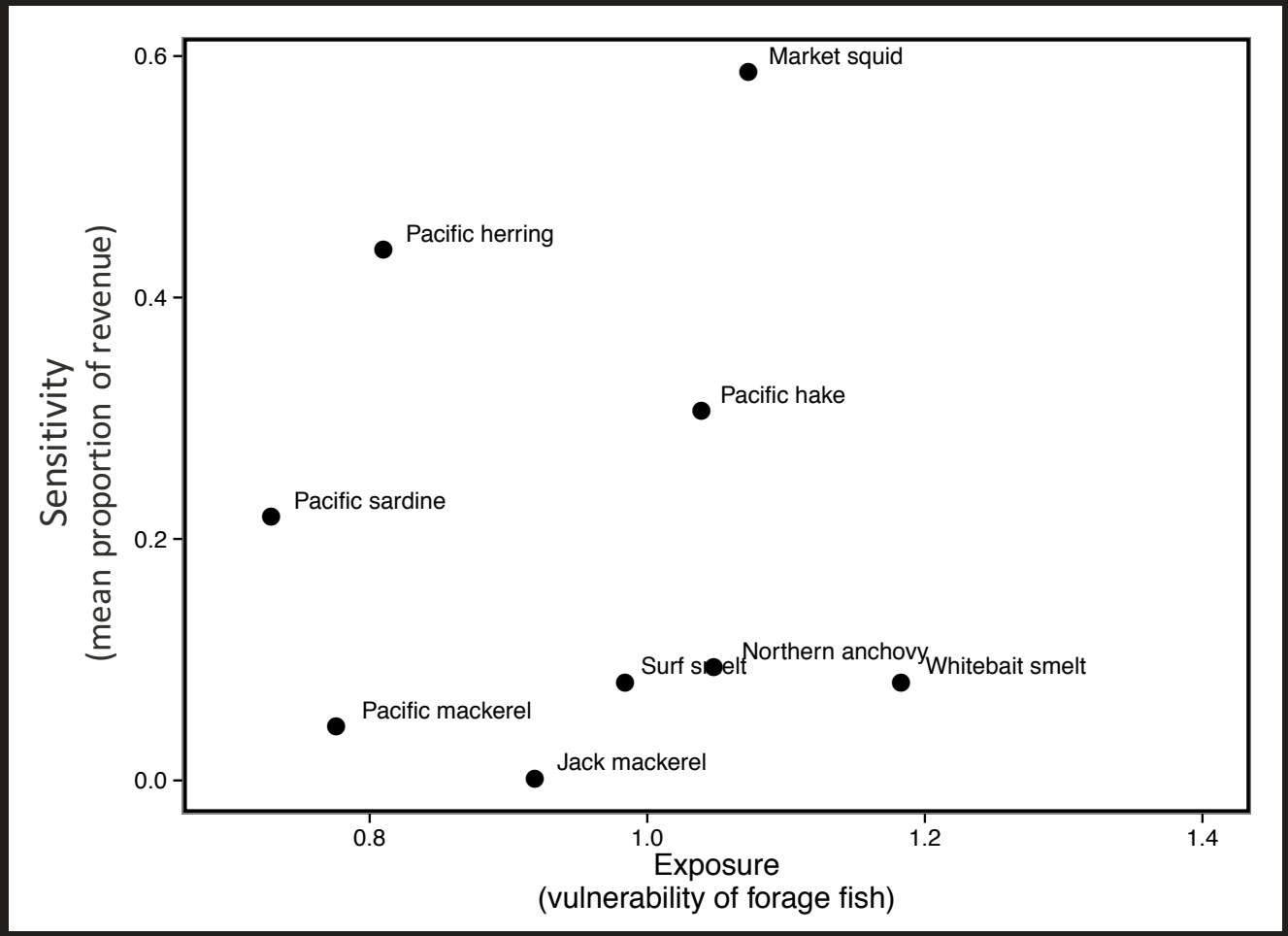
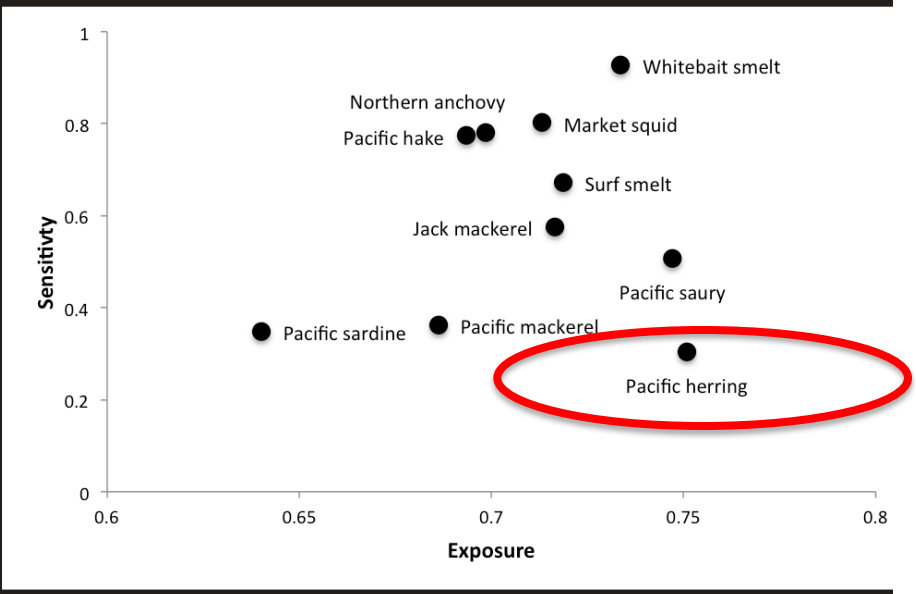
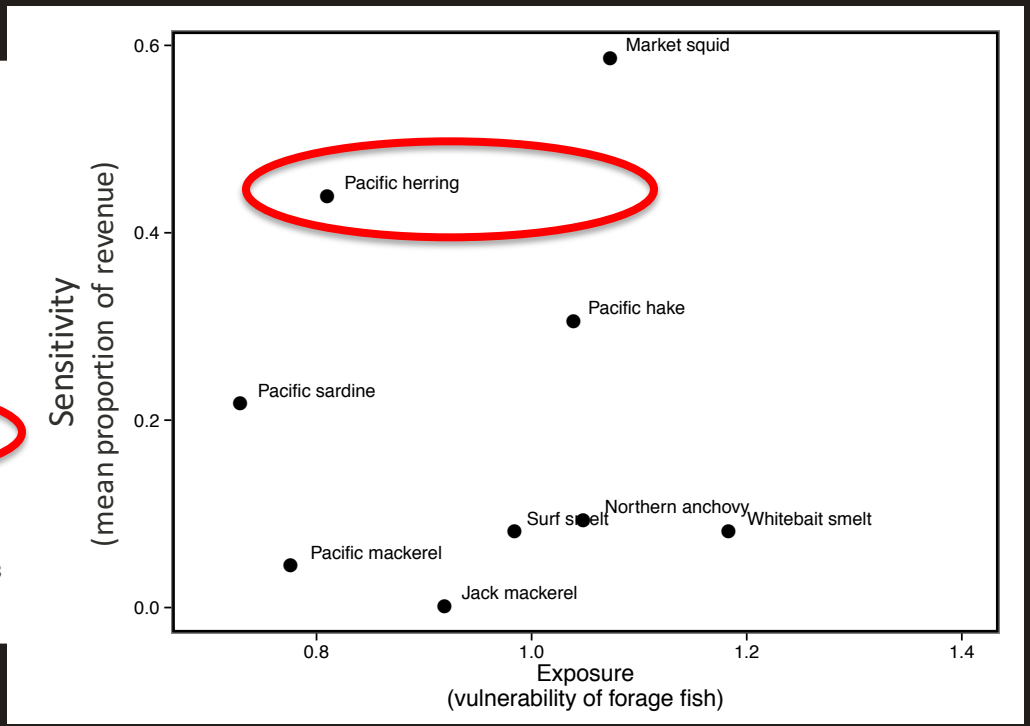


Also see
Barange et al. 2014,
Ekstrom et al. 2014,
Mathis et al 2015

Fish vulnerability

Fishery vulnerability



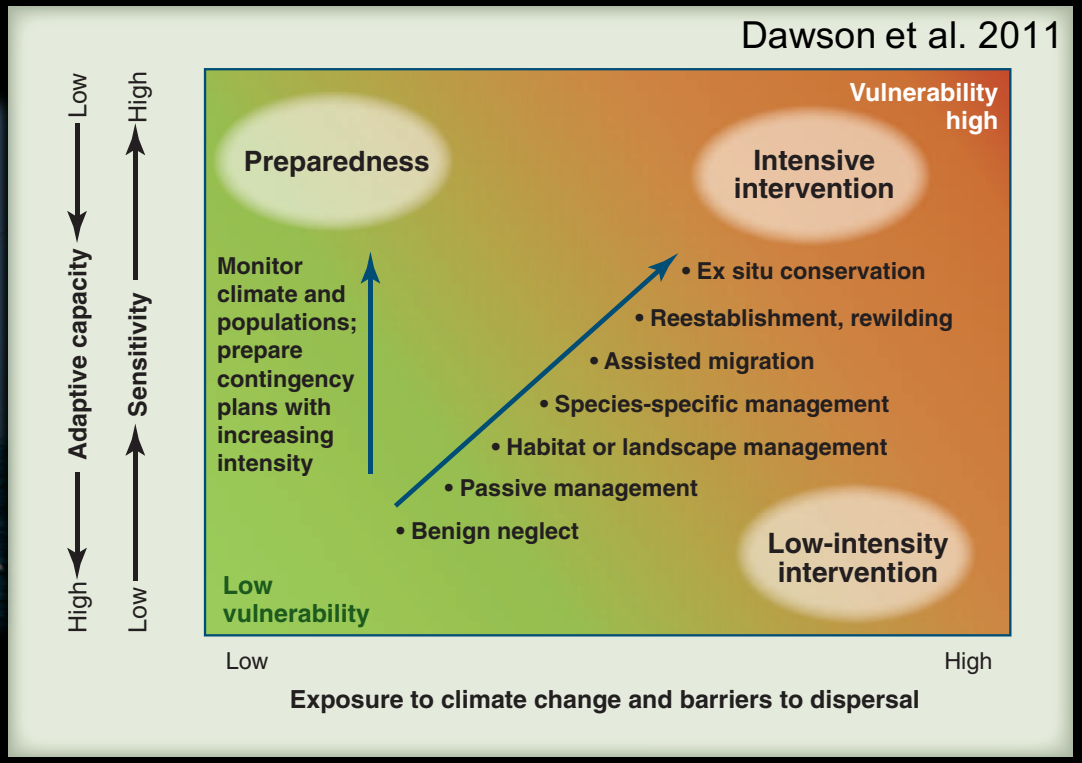


Samhouri et al. in prep

Is a vulnerable fish a vulnerable fishery?

Squid: the gilded seine?

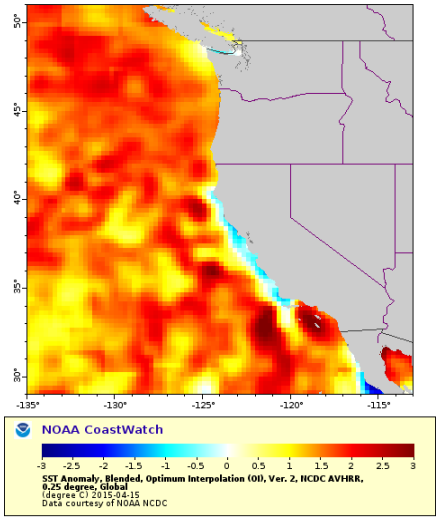
Dawson et al. 2011



Samhouri et al. in prep

Horizons

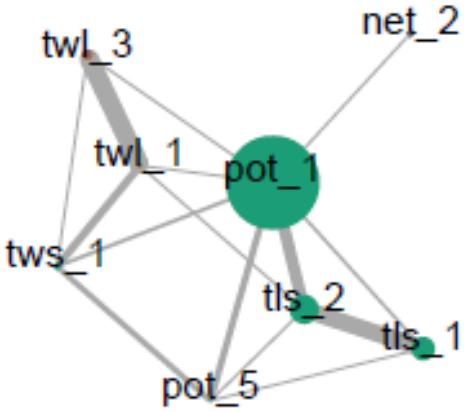
1. Scaling up and down



2. Closing data gaps

3. Event-based assessments?

Fisheries participation networks



What hasn't been covered

1. Human activities indicators

2. Ecosystem-based reference points for environmental drivers and non-fisheries human activities

3. Climate change vulnerability for HMS and protected species

4. Management strategy evaluation

"We've considered every potential risk except the risks of avoiding all risks."

IEA

INTEGRATED ECOSYSTEM ASSESSMENT

WHAT CAN RISK DO FOR YOU?