

# Ocean Acidification & Hypoxia on the US West Coast

Effectively linking science & policy in the face of a changing climate

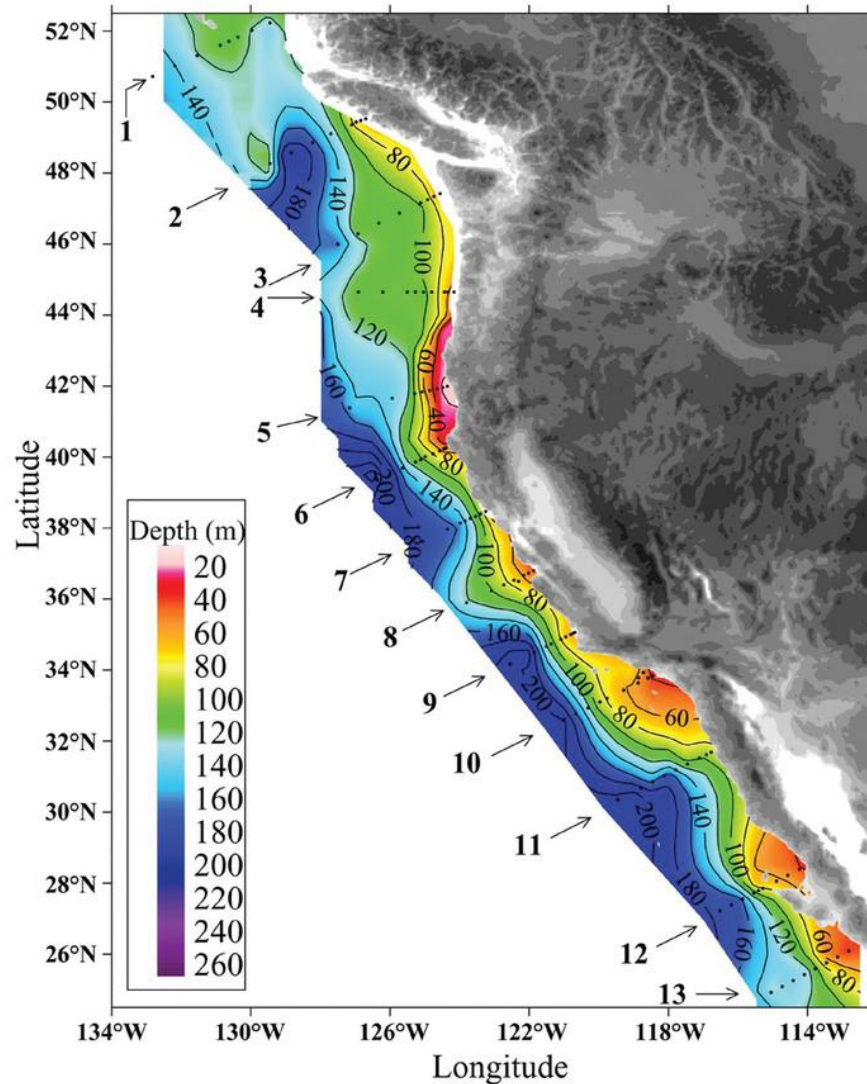


Liz Whiteman

*California Ocean Science Trust*



# Shared challenge: high vulnerability



Feely et al. 2008

# A new approach

## All hands on deck

‘We’re aggressively linking science to management and regulatory decisions...in the face of a changing climate and multiple threats impacting ocean health’

*Cat Kuhlman,  
Deputy Secretary for Coasts and Oceans*



# Early conversations focused attention

## Ocean Acidification Could Be Creating Friendless Fish

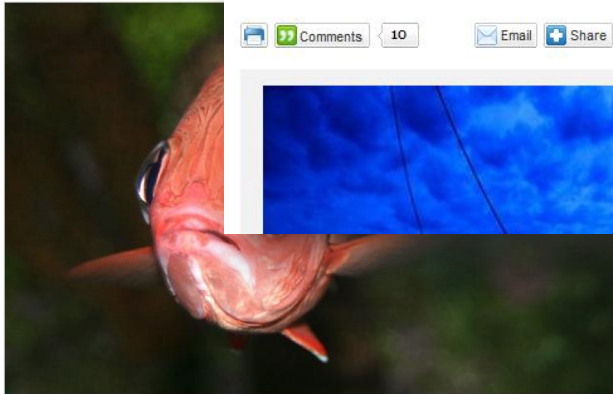
As CO2 levels rise, coral-reef fish seem to lose the ability to recognize each other.

JOHN METCALFE | @citycalfe | Jul 1, 2014 | 1 Comment

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## Washington is first state to tackle ocean acidification

Comments 10 | Email | Share 128 | Tweet 37 | Like 91 | +1 0



David Touchtone/Shutterstock.com

## So Long, Seafood! Ocean Acidification Projected to Slam Alaskan Fisheries

By Zoë Schlanger

Filed: 7/29/14 at 9:13 AM | Updated: 7/29/14 at 10:36 AM



## Changes in ocean put shellfish business in jeopardy

By Bill Sheets, Herald Writer

EVERETT -- Between 2005 and 2009, billions of oyster larvae began dying at hatcheries around the state before anyone knew what was going on or could do anything about it.

The state's \$270 million shellfish industry, which employs about 3,200 people, is in danger.

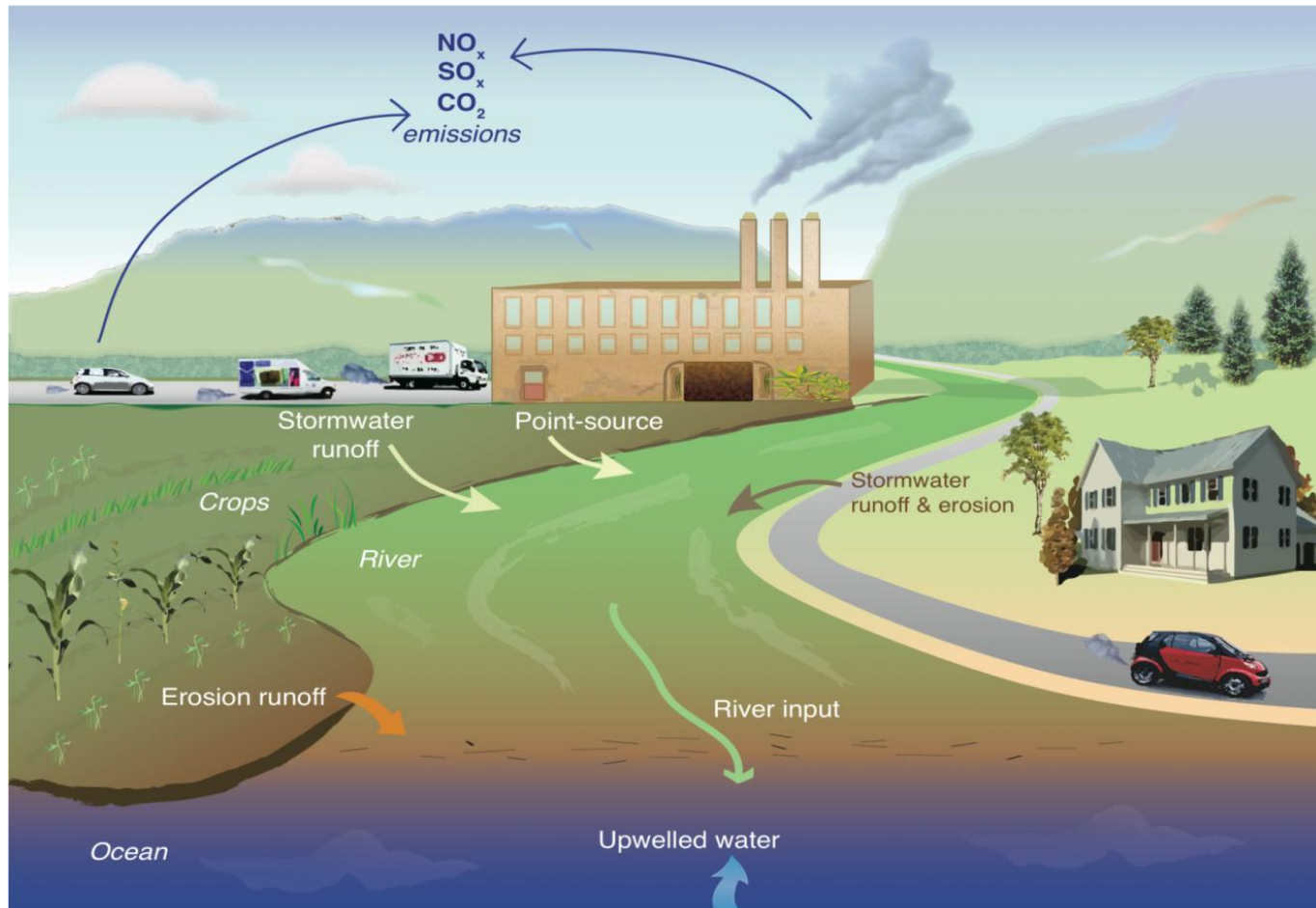
One oyster farm, Goose Point Oysters in Willapa Bay, has begun raising oyster larvae in Hawaii because it can no longer grow them here.



Dan Bates / The Herald  
Penn Cove Shellfish workers on Wednesday harvest mussels, clams and oysters.

And narrowed the dialogue to calcifying organisms

# A call to mitigate, regulate, and control



Modified after Kelly et al. (2011) *Science*



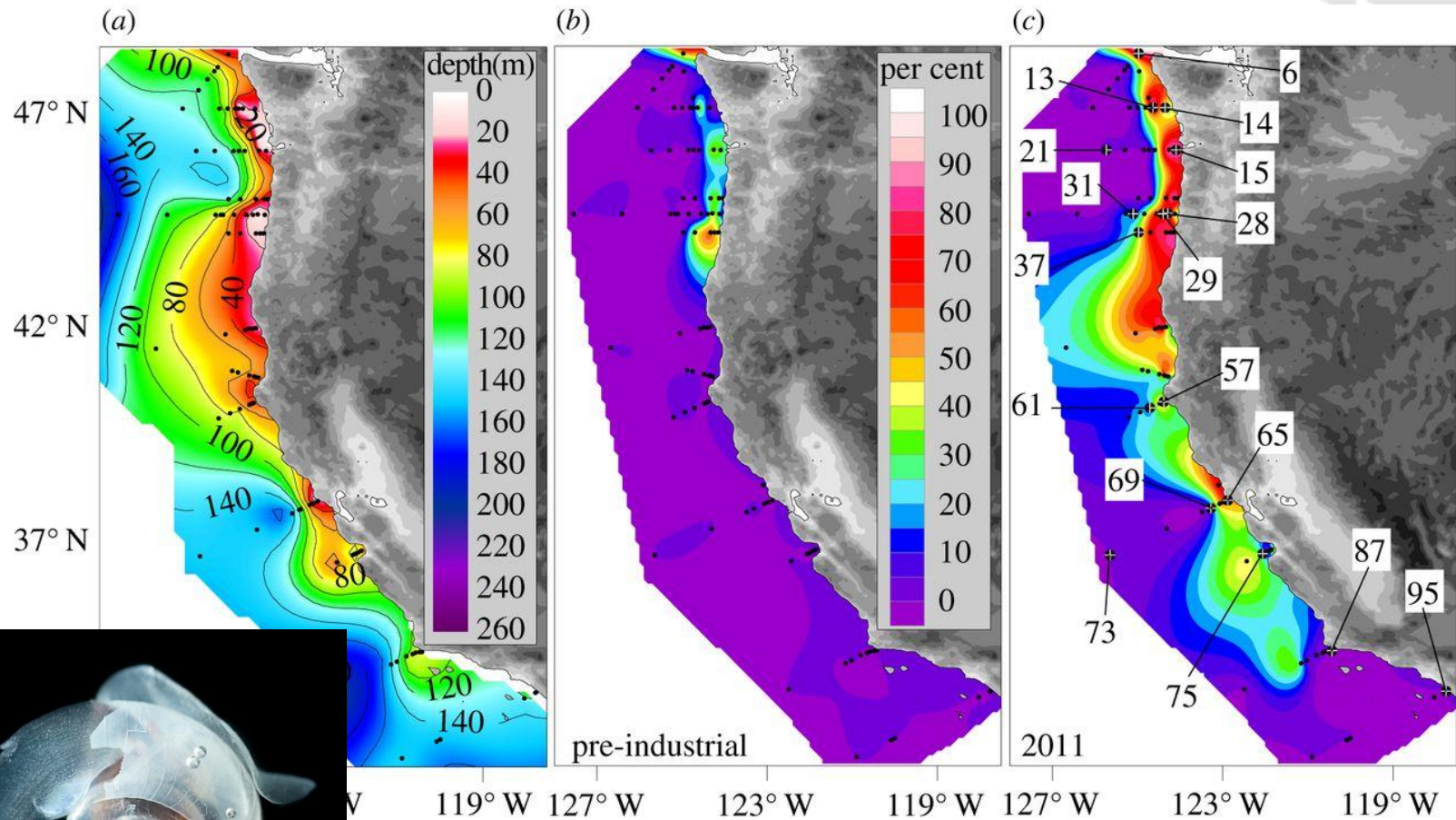
# California has building blocks in place...



- + Non-point Source Pollution Program
- + NPDES Permit Program

...but is that all we need to do?

# But are hotspots all bad?



# Reaching beyond boundaries for science

## Ocean Acidification and Hypoxia: Today's Need for a Coast-Wide Approach

*The West Coast Ocean Acidification and Hypoxia Science Panel*



### Building From Early Action

Since ocean acidification first became recognized as a potentially significant issue for marine ecosystems, a worldwide effort has ramped up to understand where and how deleterious effects might manifest. The production failures at commercial shellfish operations in both Oregon and Washington between 2005 and 2009 were a striking reminder of the potential consequences of ocean acidification to ecologically and commercially important resources, and of the limits to our knowledge about these impacts.

A series of high-level briefs have sought to summarize the



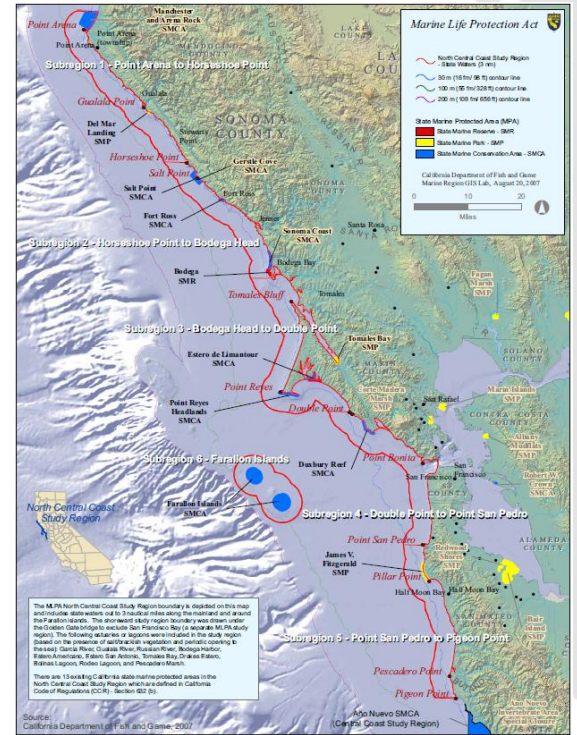
# A new science dialogue



*Protecting ecosystems in the face of multiple stressors*

Acting now is about conferring the greatest resilience and capacity to adapt to a changed future

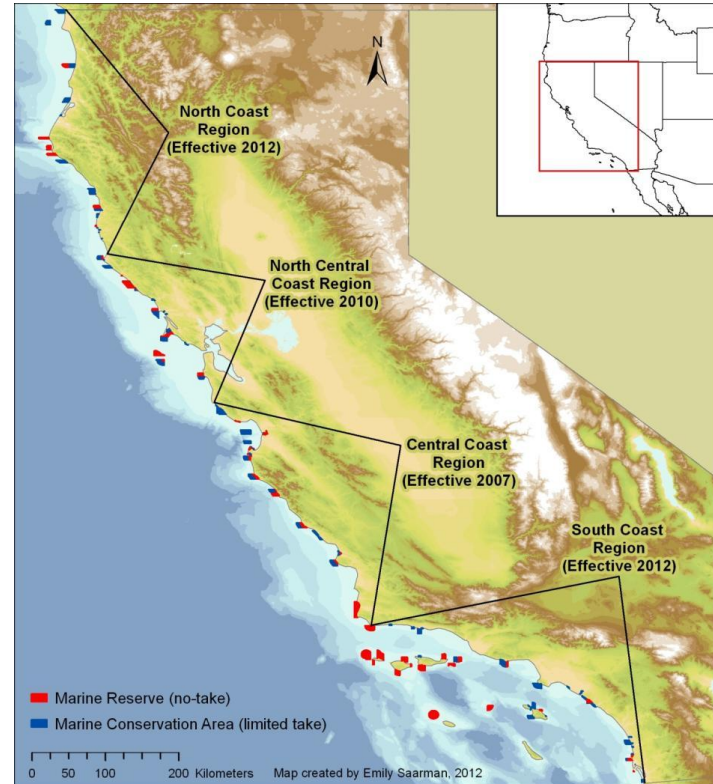
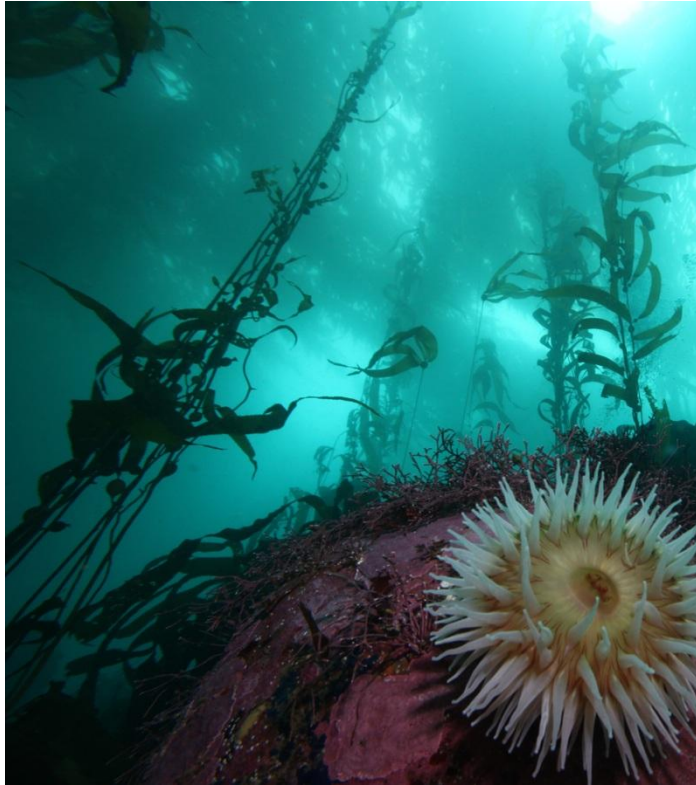
# Broadens the 'toolbox' to address OAH



...with many tools already in place



# California's investment...

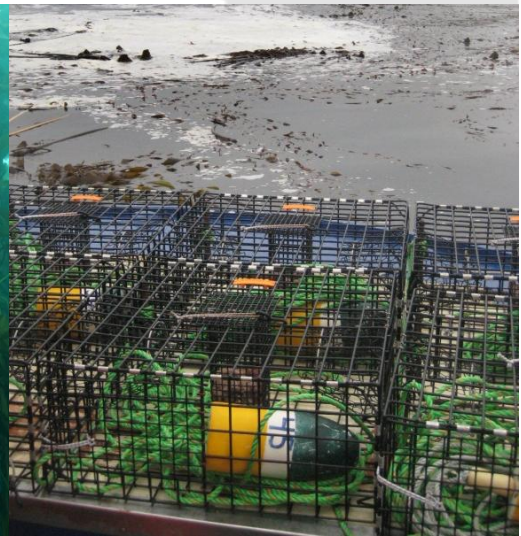
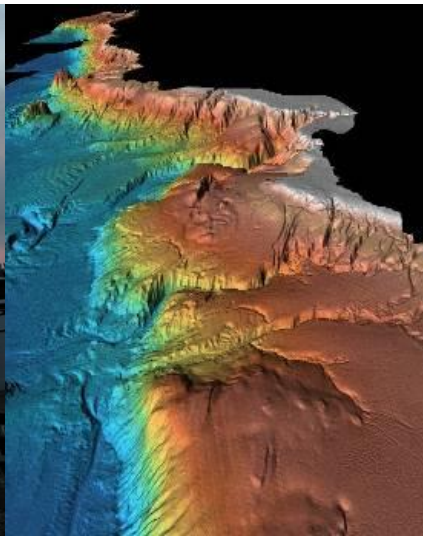


A statewide network of 124 MPAs to protect and restore ocean ecosystems

...can pay dividends

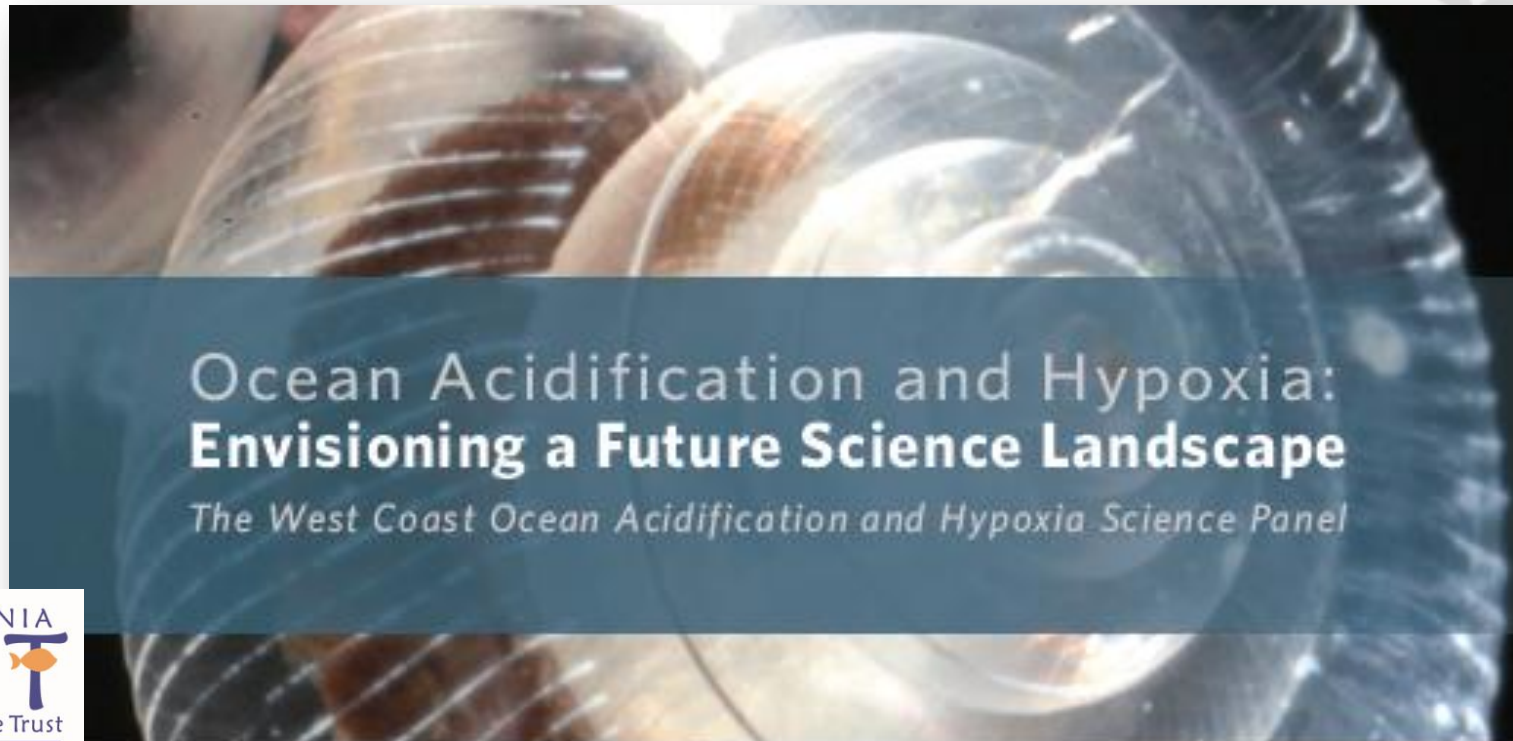
‘Ecosystem monitoring will reveal the all the surprises ahead’ FRANCIS CHAN

And allow us to adaptively respond





# 'Vulnerability is not chemistry'



## Ocean Acidification and Hypoxia: Envisioning a Future Science Landscape

*The West Coast Ocean Acidification and Hypoxia Science Panel*



### Vision

*Facing environmental concerns with wide ranging impacts, we work together in strategic and concerted ways toward studying, monitoring,*

Concerns are growing at multiple levels of government about the effects of ocean acidification and increasing hypoxia events on ecosystems along the coasts of California, Oregon, Washington, and British Columbia. Thoughtful and strategic research and monitoring will be essential to improve understanding of these impacts and to develop effective management and mitigation options. Working with the West Coast Ocean Acidification and Hypoxia Science Panel, the California Ocean Science Trust has developed this vision for

# A multi-stressor view

Shifts the conversation from end of pipe to ecosystem resilience...



...and links carbon emissions with ocean resource management

# A new approach

## All hands on deck

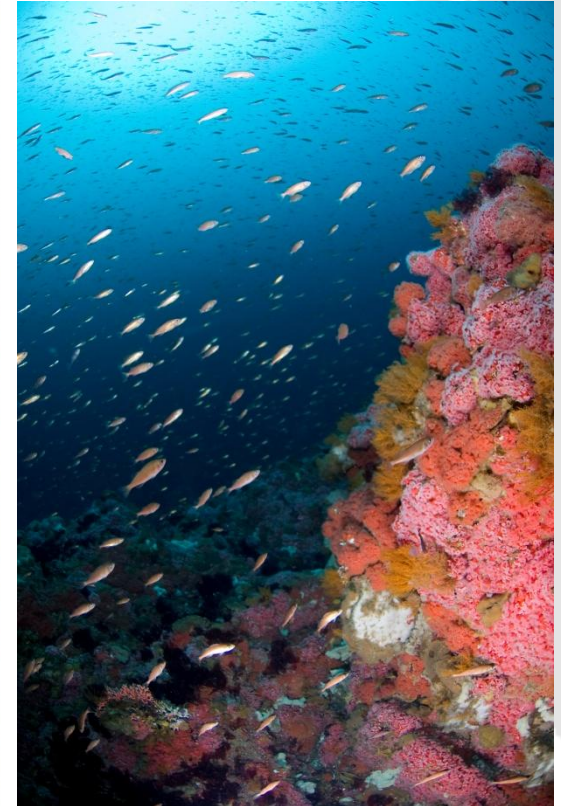
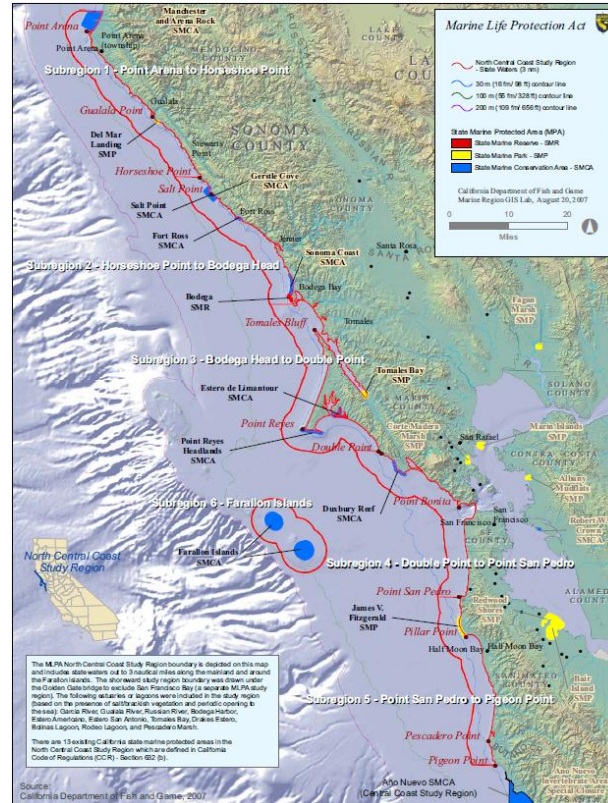
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# A foundation for science-informed policy



And the landscape, tools and will to act



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# A new science and policy dialogue



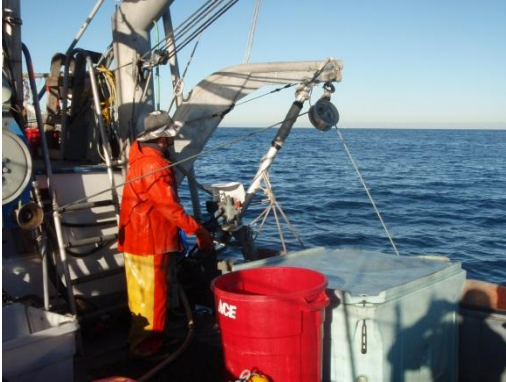
Adopt a **multi-stressor** approach

Build cross-jurisdictional **partnerships**

Bolster **ecosystem resilience** in the face of uncertainty

Vision **ecosystem monitoring** of “things we care about”

# Bringing adaptation into focus



- + New collaborative partnerships
- + Salient scientific research with policy relevance
- + Learning, communication
- + Building social capacity to adapt