



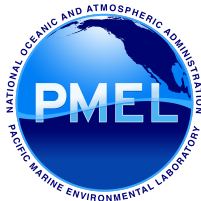
PMEL

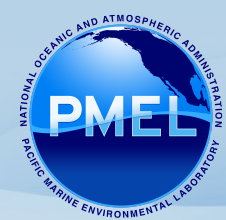
Pacific Marine Environmental Laboratory

Marine Ecosystems

Ocean Environment Research Division

Dr. Jeremy T. Mathis





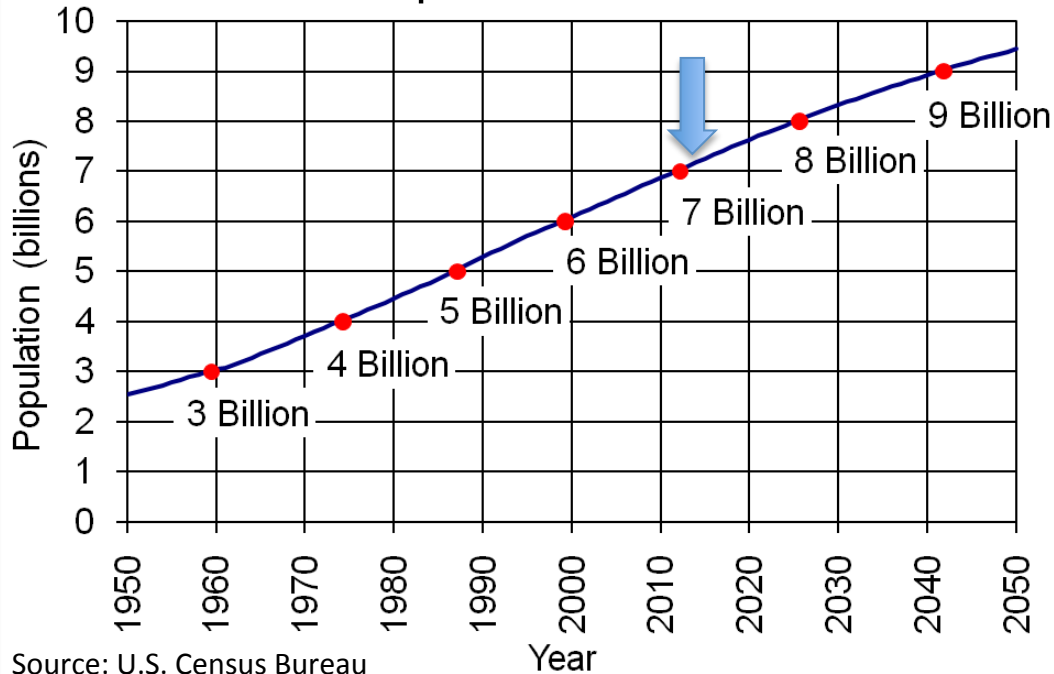
Context for Marine Ecosystems

**OVER 1 BILLION PEOPLE DERIVE ALL OF THEIR
DIETARY PROTEIN DIRECTLY FROM THE OCEANS**



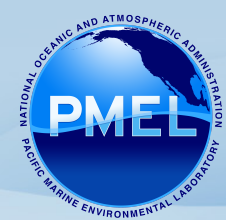
Context for the Marine Ecosystems

World Population: 1950-2050



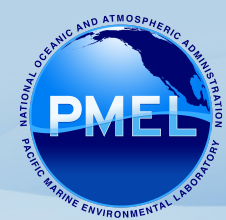
Source: U.S. Census Bureau

- Energy consumption could increase 56% by 2040. (U.S. EIA)
- Worldwide consumption of seafood could triple by 2030. (Stanford Woods)
- Ambient ocean noise could double from 1950's levels by 2100 due to increased shipping, energy and mining exploration, and icebergs.
- Approximately 3 billion people live within 200 kilometers of a coastline. By 2025, that figure is likely to double. (U.N. Assessment)



Marine Ecosystem Mission

Measure, understand, and predict the impacts of physical, chemical, biological, geological, acoustic, and anthropogenic processes on the oceanic food web.



Marine Ecosystems Programs

Leading the Teams

1. Ecosystems & Fisheries Oceanography Coordinated Investigation

- Group Leader – Dr. Phyllis Stabeno (28 years of experience at PMEL)



2. Ocean Acidification

- Group Leader – Dr. Richard Feely (40 years of experience at PMEL)



3. Earth-Ocean Interactions

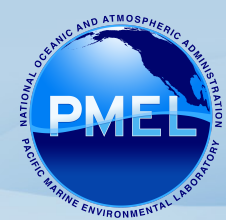
- Group Leader – Dr. Bill Chadwick (25 years of experience at PMEL)



4. Acoustics

- Group Leader – Dr. Bob Dziak (26 years of experience at PMEL)





The ECO-FOCI Group

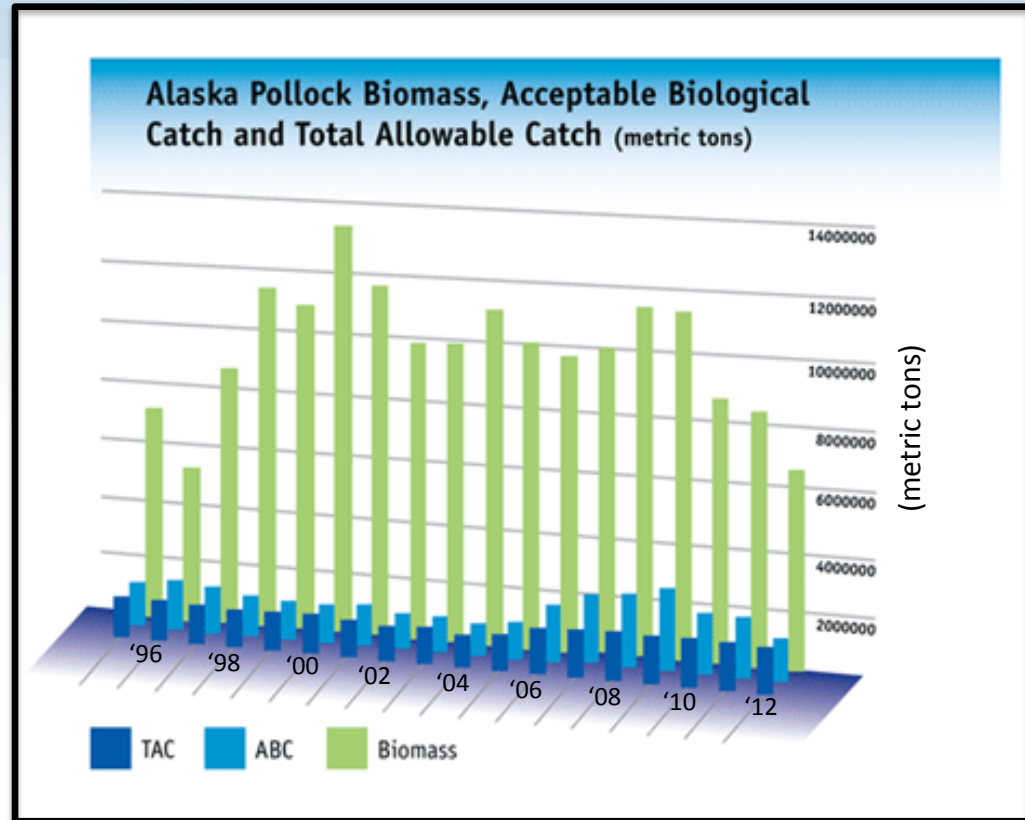


Fisheries-Oceanography
Coordinated Investigations

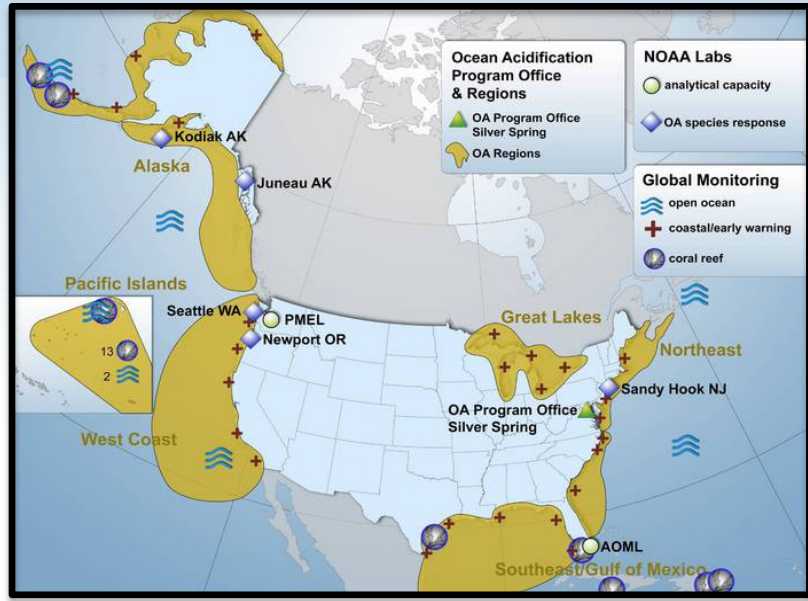
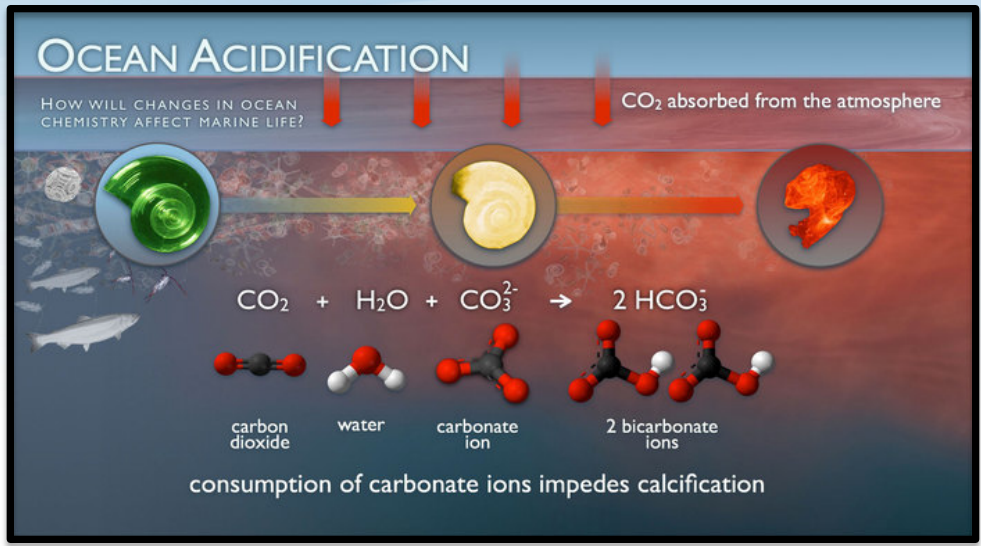


North Pacific Climate
Regimes and Ecosystem
Productivity

A common goal of these research programs is to study relationships between the marine ecosystem, climate, and the survival of commercially valuable fish in the Gulf of Alaska and eastern Bering Sea.

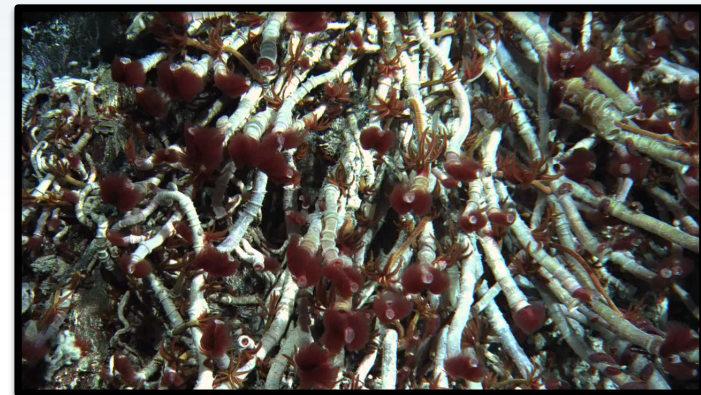
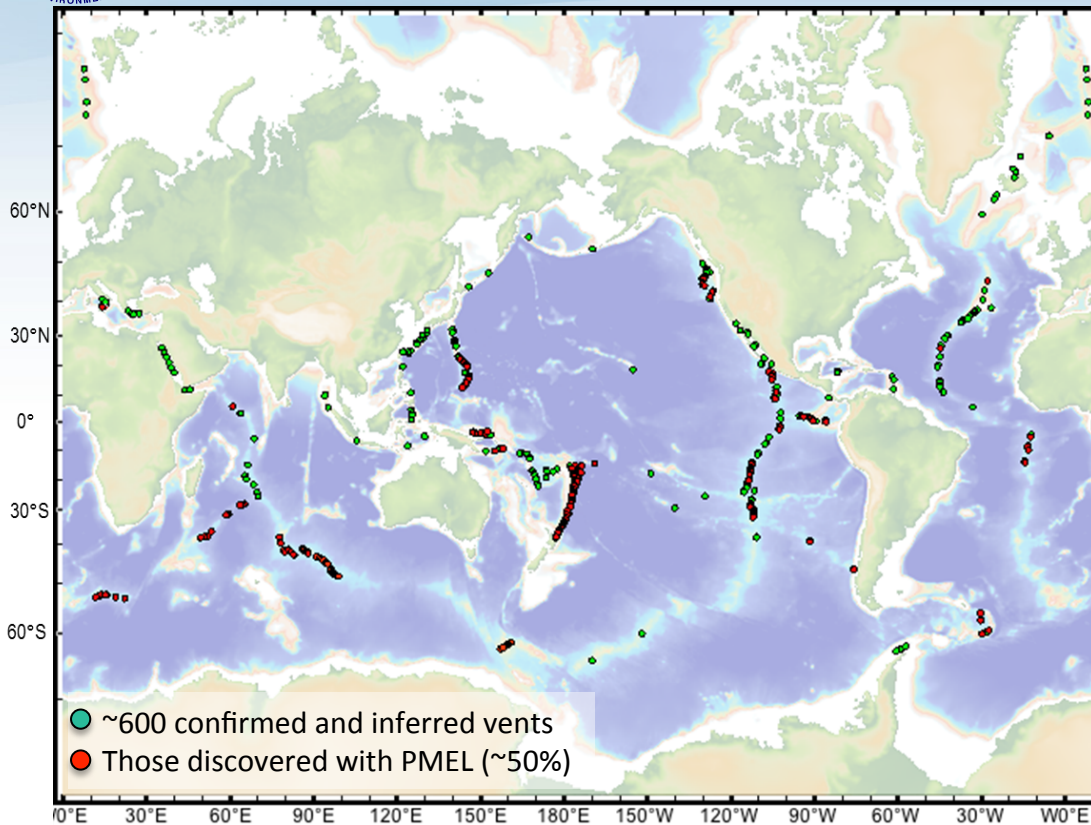


The Ocean Acidification Group



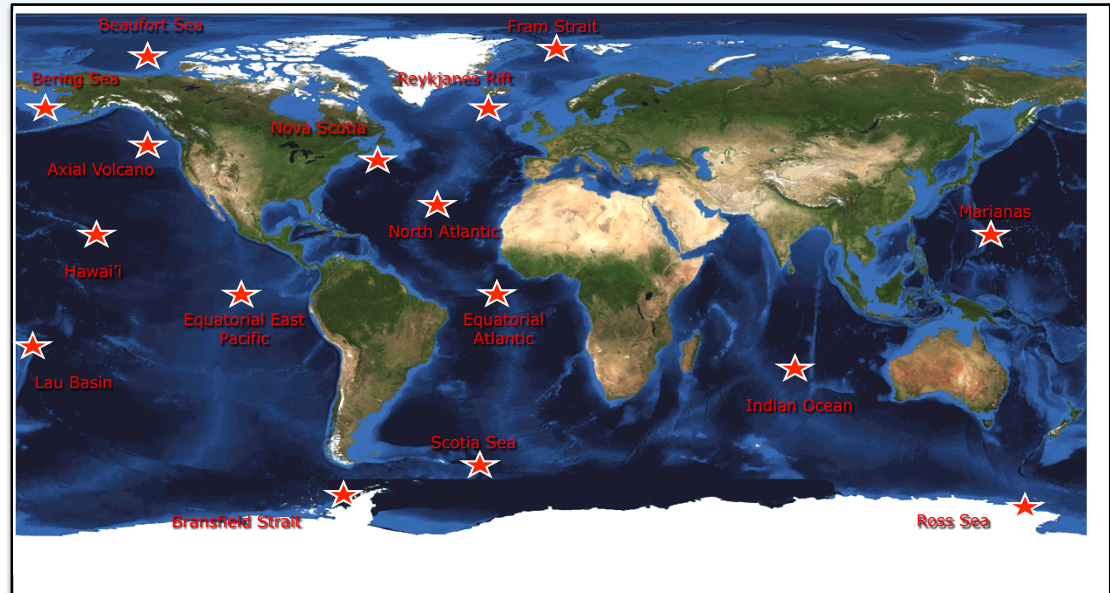
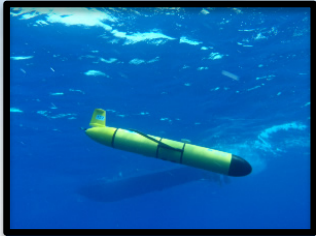
Oceanographers in our group have been studying how CO₂ emissions affect the ocean system for more than three decades and continue to monitor ocean acidification in all the world's oceans from coral reef ecosystems to the Arctic Ocean.

The Earth-Ocean Interactions Group



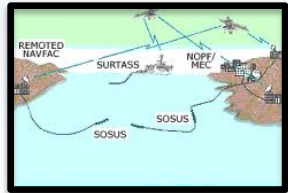
The Acoustics Group

Acquire long-term data sets of the global ocean acoustics environment, and identify and assess acoustic impacts from human activities and natural processes on the marine environment.

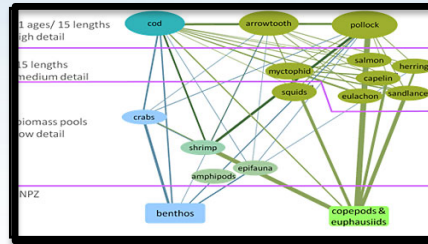


Performance Technologies

Moorings



Models

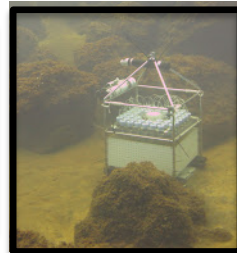
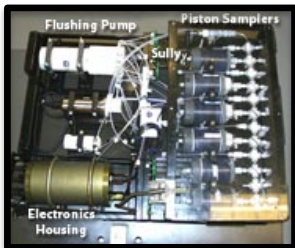


FEAST

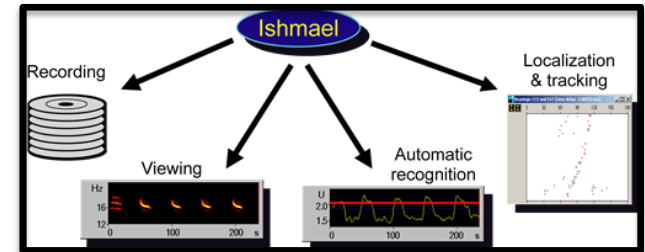
Platforms



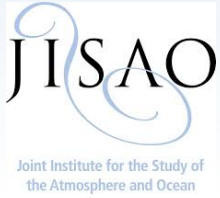
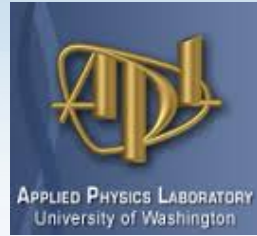
Instruments

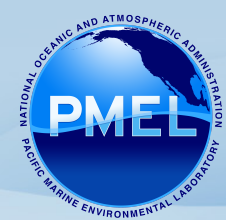


Software



ISHMAEL

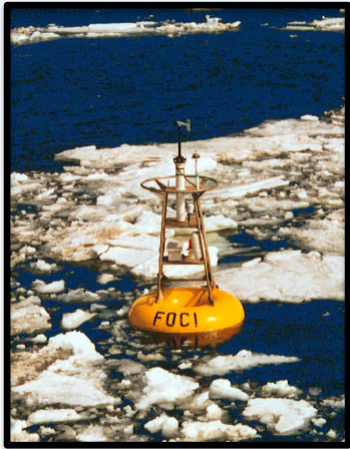




Synergies

What Makes PMEL Unique

Expertise + Partnerships + Engineering + Administration



M2 Mooring



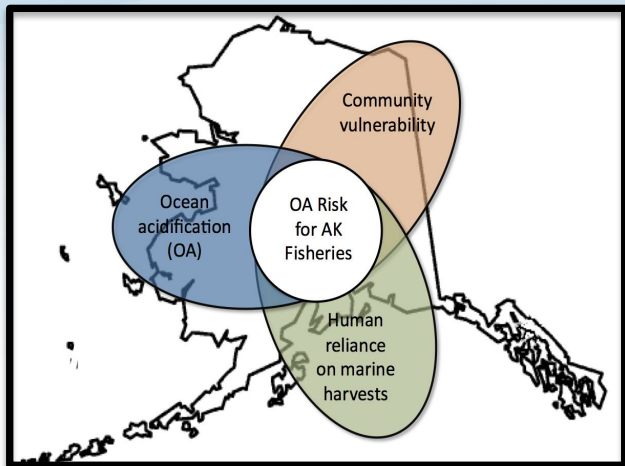
Maug as an OA natural laboratory



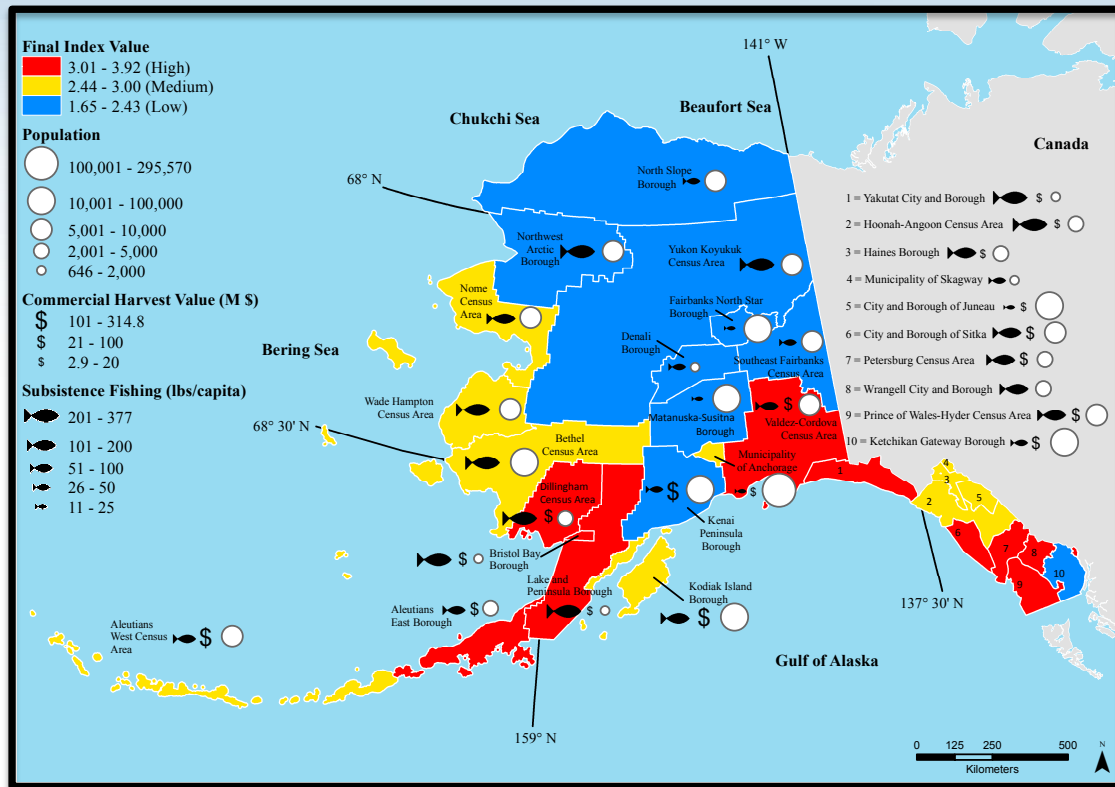
Gliders studying OA in Alaska

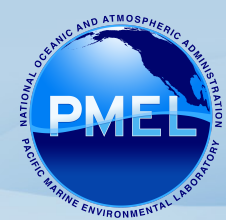
Synergies

What Makes PMEL Unique



Risk - The chance that an investment's actual return will be different than expected. Risk includes the possibility of losing some or all of the original investment. (Mathis et al., 2014)





Relevance

Supporting Regulation

The Marine Mammal Protection Act

Passed in 1972 to prohibit, with certain exceptions, the "take" of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

The Magnuson-Stevens Act

Passed in 1976 (1996, 2007), the law mandates the use of annual catch limits and accountability measures to end overfishing, provides for widespread market-based fishery management through limited access privilege programs, and calls for increased international cooperation.

The Endangered Species Act

Passed in 1973, it recognized that our rich natural heritage is of "esthetic, ecological, educational, recreational, and scientific value to our Nation and its people."

Federal Ocean Acidification Research and Monitoring Act (FOARAM)

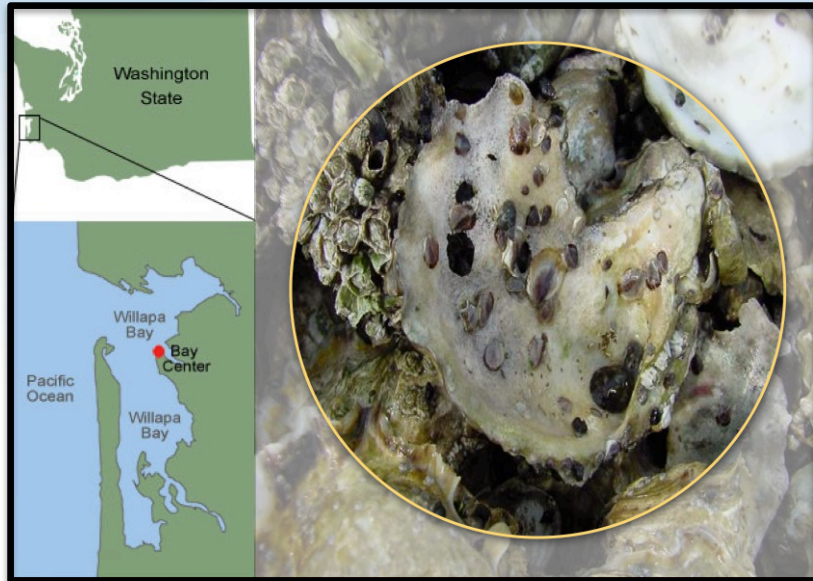
Passed in 2009, this legislation requires the development of adaptation strategies to conserve ecosystems (both at regional and national levels) vulnerable to the effects of OA, and the associated socio-economic impacts.

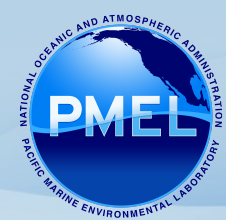
Relevance



Relevance

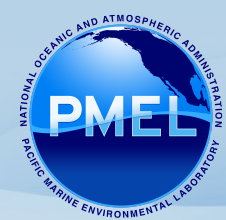
Massive die-offs in oyster hatcheries in the Pacific Northwest due to the intrusion of high CO₂ water.





Accomplishments Over the Past 5 Years

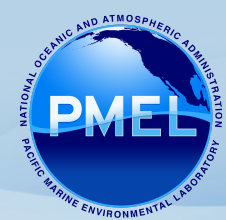
- Significant contributions to better understanding of the Bering Sea and Gulf of Alaska Ecosystems through BEST-BSIERP and GOA-IERP.
- Creation and coordination of the Global Ocean Acidification Observing Network.
- Documented a full eruption cycle at a submarine volcano and its impacts on hydrothermal ecosystems and characterized new hydrothermal ecosystems within the US EEZ and Marine Protected Areas.
- Recorded North Atlantic Right Whales in an area where thought to be extinct and expanded global hydrophone coverage with eight new hydrophone experiments.



Performance

Research Leadership and Planning

- Phyllis Stabeno has lead a number of initiatives in the Bering Sea and the Arctic Ocean and been a guest editor for multiple special issues of high-profile journals.
- PMEL PIs have contributed to several IPCC Assessments and OA planning documents.
- Chadwick and Butterfield serve on a Science Advisory Group to the Schmidt Ocean Institute to support the design and deployment of hybrid remotely operated vehicle.
- Bob Dziak is a committee member of the cross-line office team (OAR,NOS and NMFS) helping to develop the Ocean Noise strategy for NOAA and a member of the Cascadia Initiative to assess earthquake hazards in the Pacific NW.



Quality Awards 2008-2014

- **Fellows of the American Geophysical Union**

- Christopher L. Sabine – 2013
- Edward T. Baker – 2012

- **Fellow of the Geological Society of America**

- Robert W. Embley – 2010

- **Bronze Medals**

- Stephen R. Hammond, et. al. – 2012
- James E. Overland – 2011
- Robert W. Embley, Et. Al. – 2009
- Phyllis J. Stabeno, William Parker, William Floering, Carol DeWitt – 2008

- **Outstanding Employee Awards**

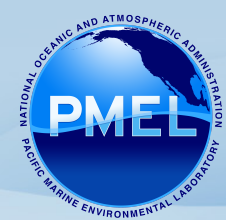
- Simone Alin– 2011 NOAA Employee of the Month
- Christopher L. Sabine – 2009 OAR Employee of the Year for Leadership

- **Best Paper Awards**

- Edward T. Baker – 2013 Best Paper Award
- Richard A. Feely, Christopher L. Sabine – 2009 OAR Outstanding Scientific Paper Award

- **Miscellaneous Awards**

- James E. Overland et al., – 2011 NOAA Administrator's Award
- Christopher Sabine, Stacy Maenner Jones, Christian Meinig, Noah Lawrence-Slavas, Patrick D. McLain, Randy E. Bott – 2011 NOAA Technology Transfer Award
- Stephen R. Hammond. – 2011 Distinguished Career Award
- Richard A. Feely– 2010 Heinze Foundation Environmental Award
- S. Allen Macklin – 2009 PICES Ocean Monitoring Service Award



Future Directions

- Continue to develop initiatives that integrate multiple groups, NOAA programs, other agencies and academic partners to leverage resources, platforms and expertise to carry out projects that would otherwise be impossible.
- Continue to respond to specific stakeholder needs, especially in understanding natural variability and anthropogenic impacts as they expand and intensify.
- Expand the scope of all four research groups into high latitude regions where rapid environmental changes are leading to unprecedented expansions in shipping and resource development as well as changes to marine ecosystems.
- Continue to invest in new autonomous sensors and platforms that reduce the need for ship-based observations or support.