Changing Waters:
Potential Adaptation Strategies for Ocean Acidification

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Bodega Marine Lab:
UC Research Station, Teaching Facility and 363 acre nature reserve founded in 1960.

Hosts Faculty Researchers from UC Davis, Staff Scientists, Graduate Students and Undergraduates. Research Focus on:

- Marine Ecology and Evolution
- Coastal Oceanography
- Fisheries Management
- Conservation Policy
- Climate Change and Ocean Acidification
Ocean Acidification: The “other” CO₂ problem

Global carbon dioxide budget (gigatonnes of carbon per year)

- Fossil fuel & cement: 6.4 ± 0.4 (1990-2000), 7.7 ± 0.5 (2000-2008)
- Atmospheric growth: 3.1 ± 0.1 (1990-2000), 4.1 ± 0.1 (2000-2008)
- Land use change: 1.6 ± 0.7 (1990-2000), 1.4 ± 0.7 (2000-2008)
- Land sink: 2.6 ± 0.9 (1990-2000), 2.7 ± 1.0 (2000-2008)
- Ocean sink: 2.2 ± 0.4 (1990-2000), 2.3 ± 0.5 (2000-2008)

Geological reservoirs
Ocean Acidification: The “other” CO₂ problem

Ocean acidification

1. Late 1800s: Reduced acidity
   - Lower concentration of atmospheric CO₂
   - CO₂ (carbon dioxide)
   - Carbonate ions
   - H₂CO₃ (carbonic acid)
   - H⁺ (free hydrogen ions)
   - HCO₃⁻ (bicarbonate)
   - Abundant healthy corals, mollusks, and other marine calcifiers

2. 2100 (projected): Increased acidity
   - Higher concentration of atmospheric CO₂
   - CO₂ (carbon dioxide)
   - Carbonate ions
   - H₂CO₃ (carbonic acid)
   - H⁺ (free hydrogen ions)
   - HCO₃⁻ (bicarbonate)
   - Fewer, smaller marine calcifiers

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How to adapt:
Monitoring
How to adapt: Monitoring
How to adapt: Understanding Key Species
How to adapt:
Protect Early Life Stages,
Buffer Chemistry
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How to adapt:
Conserve Genetic Diversity,
Develop Resilient Varieties
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Abalone Life Cycle

FREE-LIVING
Trochophore larvae

FREE-SWIMMING
Velier larvae

FERTILIZATION
Sperm
Egg

SPAWNING
Fertilized egg

GROWTH
Male
Female
Juvenile

SETTLING
Post-larvae (spat)
How to adapt:
Conserve Genetic Diversity, Develop Resilient Varieties
Thanks!